

INNOVATION IN THE FACE OF ADVERSITY: MAJOR-GENERAL SIR PERCY
HOBART AND THE 79TH ARMoured DIVISION (BRITISH)

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Military History

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ABSTRACT

INNOVATION IN THE FACE OF ADVERSITY: MAJOR-GENERAL SIR PERCY HOBART AND THE 79th ARMOURED DIVISION (BRITISH), by MAJ Michael J. Daniels, 116 pages.

On 11 March 1943, the Chief of the British Imperial General Staff, Field Marshal Sir Alan Brooke, made a momentous decision in committing an entire British armored division, the 79th, to the task of developing equipment, tactics, and capabilities to penetrate the “Atlantic Wall,” in anticipation of an Allied amphibious invasion of northwest Europe. British leaders chose Major-General Sir Percy Hobart to command this division, largely because of Hobart’s affinity for leading and training armored formations, but also due to Hobart’s reputation as an individualist, known to seek out unique solutions to unforeseen challenges.

This thesis examines the wartime history of this unit--concentrating on aspects of equipment, tactics, organization and leadership that enabled it to ultimately succeed beyond anyone’s expectations. More important, this organization provides valuable lessons for current transformation efforts. The key lessons that this subject provide include: the need for leadership that combines vision with action; a close cooperation between the military-industrial complex and the end user; and allowing space in the force structure for a unit that can perform not only standard combat missions, but can also serve as experimentation test-bed and conduit for new ideas, whether in the form of capabilities, organizational structure, or doctrine.

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ACRONYMS

AAR	After Action Report
ARK	Armored Ramp (C)arrier
AFV	Armored Fighting Vehicle
AVRE	Armoured Vehicle, Royal Engineer. A modified Churchill tank fitted with various devices (bridges, fascines, carpets) so as to overcome obstacles to mounted movement.
CDL	Canal Defense Light (tank-mounted)
CG	Commanding General
CIGS	Chief of the (British) Imperial General Staff
CinC	Commander in Chief
CIRD	Canadian Indestructible Roller Device
CO	Commanding Officer
COSSAC	Chief of Staff to the Supreme Allied Commander (Designate)
COXE	Combined Operations Experimental Establishment
DD	Duplex Drive amphibious tank
DUKW	2 1/2-ton, 6x6 amphibious truck
ETO	European Theater of Operations
ETOUSA	European Theater of Operations, United States Army
GHQ	General headquarters
LCA	Landing Craft, Assault
LCI	Landing Craft, Infantry
LCT	Landing Craft, Tank
LCVP	Landing Craft, Vehicle and Personnel
LO / LNO	Liaison Officer (British / U.S.)

LST	Landing Ship, Tank
RAC	Royal Armoured Corps
RE	Royal Engineers
REME	Royal Electrical and Mechanical Engineers
RM	Royal Marines
RTR	Royal Tank Regiment
SADE	Specialized Armor Development Establishment
SBG	Small Box Girder bridge (mounted on AVRE)
SETF	Special Engineer Task Force
SHAEF	Supreme Headquarters, Allied Expeditionary Force

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CHAPTER 1

INTRODUCTION

No thought is completely original--a spark from one mind sets light to an idea which is incipient in another man's mind, and he in turn sets light to others. This collective effect in the development of ideas has impressed me increasingly in all my study of the history of thought, and has been corroborated in the course in the experience I have had in observing the particular development of the idea of mechanized warfare.¹

B. H. Liddell Hart

Not a great deal is known about, or has been written about, the 79th Armoured Division (British) from an American perspective. Most contributions have been from British armor and World War II enthusiasts commenting primarily on the unique character and function of the unit and its somewhat eccentric commander, Major-General Sir Percy Hobart. This thesis will examine the role the 79th Division played in northwest Europe during World War II, particularly focusing on events surrounding Operation OVERLORD. It will demonstrate the formation's relevance to the greater Allied effort in the European Theater of Operations (ETO) and relate this period of great transformation to that of the U.S. Army's current innovative thrust. It will also highlight the unique character of the division's commander and thus provide some insight into the nature and qualities of a recognized leader of change.

A chronology of the key events leading up to the Normandy invasion will be required to provide contextual background, primarily by detailing the decisions and personalities most responsible for the development of this formation and the use of new, highly specialized armor. The subsequent chapters will provide a more in-depth account

of the division's role in OVERLORD, as well as in succeeding campaigns on the continent.

There is some currency and significance to this particular historical subject area. The development of specialized armor during a world war provides an excellent example of innovative thought and organizational transformation, subject areas very relevant to today's military. The apparent lack of appreciation and writing on this subject from an American military perspective could indicate that current military leaders may unintentionally disregard this division's unique experiences. The intent of this thesis is to provide an excellent example of successful combined arms problem solving in the face of great adversity in hopes that it may serve to inform current transformation initiatives.

The 79th Armoured Division was first formed in September 1942, modeled on the more "normal" 7th and 11th Armoured Divisions. The division was not initially charged with the mission of developing new methods employing technical innovations. This decision would be made in 1943 by the then Chief of the Imperial General Staff (CIGS) Field Marshal Sir Alan Brooke. He determined that the disastrous lessons learned from Dieppe in 1942 would be even more acute in any amphibious operations mounted against the now more heavily defended northern coast of France.² He recommended that a unit be designated to assume the role of experimental armored force to develop equipment and procedures to assist in the penetration of "Fortress Europe." On 11 March 1943, the CIGS selected the 79th Armoured Division for this task, owing in great part to the character and reputation of its newly appointed commander. This unique leader was Major-General Sir Percy Cleghorn Stanley Hobart.³

Major-General Hobart had had an especially checkered career prior to his assumption of this command. Commissioned in 1906 into the Royal Engineers, his early years were spent in India as a member of the elite 1st Bengal Sappers. He managed to make his way back to France (1914-15), and then to the Middle East (1916-17), serving as a staff officer during numerous World War I campaigns. After the war and staff college Hobart volunteered for service in the Royal Tank Corps (RTC), still in its infancy. It was during this time that Hobart closely aligned himself with two pioneers in the development of armor theory then Colonel J. F. C. Fuller and Captain Basil H. Liddell Hart.

During the 1920s and early 1930s, Hobart became increasingly involved in emerging armor doctrine and played a leading role in the evolutionary tank exercises that were conducted on Salisbury Plain, England, first in 1927, and then again in 1931 and 1933. It was during these exercises that Hobart first began to shape what were to quickly become his key thoughts on the employment of armor. He was one of the first officers to suggest that tanks were perhaps best suited to an antitank role and that minesweeping tanks should be developed (a position perhaps due to his engineer roots).⁴ It was his assertion that an armored force had to split away from the confines of infantry support and to assume a more independent role. This independence was immensely difficult for the military establishment to accept, although it was right in line with many of Liddell Hart's theories at the time.

Hobart went further and pushed for more use of radio communications and for closer Royal Air Force and tank "cooperation" on operations, ideas that seem commonsensical today but were radically visionary in the early 1930s.⁵ Hobart's views

on the criticality of radio to armored mobility are best expressed when he wrote, “The first need was to inspire all officers with the belief that wireless communication between tanks on the move was practicable; and the next, to convince them that they were capable of making use of it.”⁶ Through this statement one can glean some of the essence of Hobart’s leadership style, the desire to bring his subordinate leaders around to share his passion and enthusiasm for new approaches to age-old problems. His contributions to these exercises and his demonstrated energies were ultimately rewarded with command of the 1st Tank Brigade upon its formation in 1934.

Along with two other British Army officers, both recognized pioneers in armored tactical development, George Lindsay and Charles Broad, Hobart took the lead in implementing many of Fuller’s as yet untested theories on the use and employment of armor. Hobart became a vocal advocate for heavily armored tanks that could provide “strategic strike” capability and pitched these thoughts to Winston Churchill as early as 1935.⁷ Rather than incorporate infantry into these early training exercises, the “Royal Tank Corps preferred the glamour and potential strategic decisiveness of an independent mobile role.”⁸ This attitude clashed with the ‘infantry-first’ mentality of the British Army leadership, akin to the U.S. Army’s doctrinal inclination of the period, as these leaders did not want to consider armor-led options, preferring instead lighter tanks in a support role to the infantry. A horse cavalry community prejudice also accounted for many of the difficulties these armor pioneers faced. From this divergence in perspectives would a running battle between traditionalists and the Hobart-led progressives grow.

Though the U.S. and British military establishments failed to develop a strong interest in Hobart’s theories on tank warfare, the Germans, mainly in the person of Heinz

Guderian, did develop such an interest. Guderian's development of what would become "Blitzkrieg" tactics was influenced both by the writings of Fuller and Liddell Hart and the exercises conducted and tactics developed by Hobart.⁹ As for Hobart, institutional bias, coupled with his inability to contain his somewhat volatile nature, led him to be posted to far away Egypt in 1938. It was here that Hobart would get his first division level command, of the just formed Mobile Division, a precursor to what would become known as the "Desert Rats," the 7th Armoured Division.

When Hobart first arrived in Egypt, the division was far removed from its future renown and prowess. The situation has been thus described: "Scattered motorized and mechanized troops with obsolescent equipment were all that Hobart found in Egypt as the basis for a modern armored division."¹⁰ In less than a year, Hobart's determination and drive would once again transform a major unit into a highly trained and drilled fighting force. His singularity of mind as to the preeminence of armor, coupled with his continued outspoken, quarrelsome nature would again cause him to run afoul of his superiors. Though recognized as being an "excellent trainer" and "possessing a first rate knowledge of all problems," Lieutenant-General H. M. Wilson, Hobart's immediate commander, believed Hobart to be "self-opinionated" and "lacking in stability" and felt he "showed little consideration for the feelings and wishes of others."¹¹ Upon Wilson's recommendation of 10 November 1939, General Sir Archibald Wavell would relieve Hobart of division command and send him home to England.¹² Demoralized and with his reputation shattered, Hobart retired and joined the Home Guard as a corporal.¹³

In the late summer of 1940, Prime Minister Churchill became increasingly frustrated with the military leadership's inability to make any positive movement as to

tank formations, tactics, and equipment. He began to look outside the vested leadership for someone who might make headway. In the fall of that year, a handful of people mentioned Hobart as a man who might provide the impetus and direction Churchill was looking for. Though Churchill did not empower Hobart with such scope, he did request of the CIGS in October 1940, General Sir John Dill, to put Hobart in command of the next armored division to be formed.¹⁴ Churchill was not to be dissuaded by the strong negative opinions expressed by Dill as to Hobart's ability and character. The Prime Minister was quite direct to Dill when writing on 19 October, "We are now at war, fighting for our lives, and we cannot afford to confine Army appointments to persons who have excited no hostile comment in their career. This is a time to try men of force and vision and not to be exclusively confined to those who are judged thoroughly safe by conventional standards."¹⁵ Thus was Major-General Hobart to reenter service the following month as commander of the 11th Armoured Division, very much contrary to the wishes and recommendations of the military establishment.

For the next two years Major-General Hobart exercised this new division relentlessly and infused them with his drive and spirit (or fired those found lacking). Hobart used the training methods and drills now perfected from earlier command of the 1st Armoured Brigade and 7th Armoured Division. With his energies directed inward at the division, Hobart was able to maintain a quiet peace with army leadership. In the spring of 1942, the division was notified by the War Office of a possible deployment to North Africa, likely to Tunisia. Coincidentally, this notification came at the same time as a training visit by the Prime Minister, who was very pleased with Hobart and the overall state of the division.¹⁶ Controversy would again surround Hobart prior to the division's

deployment in the fall, when army leaders cited Hobart's age and medical concerns in an attempt to keep him in England. Though the division stood trained and ready, their North Africa deployment was cancelled and the potential for further embarrassment to Hobart averted.

In late 1942, General Sir Alan Brooke, who had replaced General Dill as CIGS, became increasingly concerned as to the state of preparation the military found itself in for any potential invasion onto the continent from the north. These concerns were borne from his direct observations of early North Africa campaigning, and his belief that British armor had to take a more aggressive stance if it was to counter German might. The January 1943 Casablanca conference effectively delayed a cross-channel invasion, in favor of a Mediterranean campaign to attack the "soft underbelly" of the Axis powers. This strategy provided the CIGS some time to develop these capabilities. On 11 March 1943, General Brooke made the decision to save the 79th Armoured Division from disbandment, having only been formed months prior. by offering the unit's command to Major-General Hobart. Hobart's, and thus the division's, mission was to experiment with any equipment, innovations and tactics that would best support an amphibious assault into France,¹⁷ innovations to be "driven forward under one senior officer."¹⁸

The decision of the CIGS was informed in great part by Churchill's deeply held belief that British soldiers "should be carried into battle behind armor and be given mechanical means for accomplishing their tasks."¹⁹ Much of the impetus and British drive for innovation and experimentation at this time is directly attributable to Winston Churchill. Churchill began to press for special equipment and armaments, such as mines and bombs to be used in ports and rivers, in 1939 while in the position of First Lord of

the Admiralty. His relationship with a newly created War Office organization M.D.1 (Ministry of Defense One), also known as M.I.R. (Military Intelligence Research), would last throughout the war. This organization, to later become pejoratively referred to as “Churchill’s Toyshop,” was directly responsible for a number of combat developments (Limpet mines, “sticky bombs”, PIATs, Spigot mortar), some of which would be of use to Hobart and his division from 1943 onwards.²⁰

The British decision to dedicate a division to experimentation was in marked contrast to the policies being pursued by the U.S. Army leadership. There was still a great deal of infighting and disagreement of what role armor should play in the force structure. While the debates as to armor tactics, doctrine and ownership were on-going, it did appear in late 1941 that American military-industrial might had finally produced an acceptable armor platform, the M4 Sherman. Though soon to be found lacking in comparison to its German counterparts, the Sherman proved more capable than any British tank heretofore, and so the British Army quickly adopted it as the tank of choice following its good showing in October 1942 at El Alamein.

While the Americans demonstrated a strong unity of effort in developing and producing the Sherman, they did not mirror British eagerness in centralizing armor development under one organization, much less one man. Various experimental anti-mine devices, flame projectors, rocket launchers, armored bridges and swimming capabilities were tested and under development, with some fielded, at various points before and during the war. But there was never a central locus for these seemingly disparate efforts, as the Ordnance Department, Armored Board, Corps of Engineers and others worked around and through each other in Edgewood Arsenal, Aberdeen Proving Ground, Fort

Knox, and various training areas around the country.²¹ This ‘stovepipe’ mentality helped stymie the widespread dissemination of most specialized equipment theory, development and fielding until well after the war’s end.

To be fair, the British military establishment had piecemealed developmental efforts in a similar fashion prior to Brooke’s decision in spring 1943. But with this decision, Major-General Hobart would prove that he was indeed not only a man of some vision but a man of action too as he began herding any and all relevant capabilities under his headquarters. Now armed with the support of both the Prime Minister and the CIGS--as well as that of his (Hobart’s) brother-in-law, General Bernard L. Montgomery--Hobart had free rein to put into motion many of the ideas he had been formulating during the course of his previous three commands. He would not disappoint. He and his staff worked tirelessly to incorporate the myriad of subunits now placed under his command, and sort out how best to employ these varied formations, the only characteristic in common being their “armoured,” or more accurately, mechanized, structures.

The core of the division, in terms of accomplishing its obstacle reduction mission, was the 1st Assault Brigade RE (Royal Engineer). This brigade, formed in the summer of 1943, was charged with developing the requisite breaching and obstacle crossing capabilities to support the invasion, and thus not repeat the lessons of Dieppe. Their capability would be centered on the recently developed AVRE (Churchill Armoured Vehicle, Royal Engineer), and the various equipment and accessories required by the sappers. The 27th Armoured Brigade was the legacy (first formed) unit of the division, and as such was only equipped with light cruiser (Covenanter) tanks. By the end of 1943, when both 30th Armoured Brigade and 35th Tank Brigade²² (replaced in March 1944 by

1st Tank Brigade) came under command, all units were equipped with a mix of heavier tanks, commonly referred to as the “funnies.”²³ (See Appendix B for the 79th’s detailed order of battle.)

It is in this unique capability that the division would forever be known. The various types of armored fighting vehicles (AFVs) that owed their operational existence to the division’s efforts in 1943 included: the Sherman Crab (mine flail), Sherman DD (Duplex Drive “swimming” tank), Matilda CDL (Canal Defense Light--a top-secret, high-powered search light), the Buffalo, the Weasel, the Churchill Crocodile and the Churchill AVRE.²⁴ A detailed description of these AFVs and their capabilities, as well as division’s invasion preparation, will follow in the next chapter. What is important to note here is that by January 1944, when the army staffs gathered in England to begin the final planning for the invasion, the 79th Division was well positioned and prepared to accomplish its singular mission. “Hobo” had delivered the goods, meeting the high expectations of Churchill, Brooke and Montgomery. It was now time to put this capability to use, and for Hobart to finally see his trained formations off to combat.

¹Personal letter from B. H. Liddell Hart to Major-General Sir Percy Hobart, dated 7 December 1942. Liddell Hart Archives, King’s College London, file LH 15/11/15, #20.

²In August 1942 the Allies attempted a large-scale raid onto the northern coast of France vicinity Dieppe (Operation Jubilee). The operation failed for a number of tactical and operational reasons, too numerous to discuss here, and led to a great many Canadian and Royal Marine Commando casualties from determined German resistance. This failure drove the OVERLORD planners to take these hard-won lessons to heart and ensure that the next coastal invasion would not fail for similar reasons.

³Field Marshal Lord Alanbrooke, *War Diaries: 1939-1945*, ed. Alex Danchev and Daniel Todman (Berkeley, CA: University of California Press, 2001), 388.

⁴Kenneth Macksey, *The Tank Pioneers* (London: Jane’s Publishing, 1981), 126.

⁵B. H. Liddell Hart, *The Memoirs of Captain Liddell Hart*, vol. 1 (London: Cassell, 1965), 236-247.

⁶*Ibid.*, 248. See also Macksey, *The Tank Pioneers*, 128.

⁷Kenneth Macksey, "Hobart," in *Churchill's Generals*, ed. John Keegan (New York: George Weidenfeld and Nicholson Ltd, 1991), 246.

⁸Timothy Harrison Place, *Military Training in the British Army, 1940-1944: From Dunkirk to D-Day* (London: Frank Place Publishers, 2000), 89.

⁹Trevor J. Constable, "They Called Him 'Hobo'," *Journal of Historical Review* 18, no. 1, (1999), 7.

¹⁰*Ibid.*, 9.

¹¹Kenneth Macksey, *Armoured Crusader: A Biography of Major-General Sir Percy Hobart* (London: Hutchinson, 1967), 171.

¹²Refer to the Constable and Place citations for the personal and professional reasons for this unwarranted dismissal.

¹³Macksey, "Hobart," 247.

¹⁴Martin Gilbert (ed.), *The Churchill War Papers, vol. 2: Never Surrender, May 1940-December 1940* (New York: W. W. Norton and Company, 1995), 943.

¹⁵*Ibid.*, 962.

¹⁶Constable, 13.

¹⁷Alanbrooke, 388.

¹⁸Anon, *The Story of the 79th Armoured Division* (Hamburg, Germany: Privately Published, 1945), 9. (Subsequently referred to as *The Story of the 79th Armoured Division*).

¹⁹David Eisenhower, *Eisenhower: At War, 1943-1945* (New York: Vintage Books, 1987), 176.

²⁰For further details on other related wartime developments refer to R. Stuart Macrae, *Winston Churchill's Toyshop* (New York: Walker and Company, 1971).

²¹Peter Chamberlain and Chris Ellis, *The Sherman* (New York: Arco Publishing, 1969), 14-20; and R. P. Hunnicutt, *Sherman: A History of the American Medium Tank* (Novato, CA: Presidio Press, 1978), 394-468.

²²There was no measurable difference in the organization and equipment of British armored and tank brigades. The primary difference lay in regimental roots, with the tank brigades formed from the Royal Tank Regiments and the armored brigades from the Royal Cavalry.

²³*The Story of the 79th Armoured Division*; and David Fletcher, *Vanguard of Victory: The 79th Armoured Division* (London: Her Majesty's Stationery Office, 1984).

²⁴*Ibid.*

CHAPTER 2

PREPARATION

Remember, it isn't only the good boys who help to win wars; it is the sneaks and stinkers as well.¹

Winston S. Churchill, *The Churchill Papers*

The development of specialized armor did not begin with the March 1943 decision to re-role the 79th Division. Efforts to seek out new solutions to old tactical problems had been on-going since armor first appeared on the battlefield in numbers at Cambrai during the First World War. The interwar years saw sporadic and unrelated developments in armor capabilities, primarily in Britain, but also in the U.S., Canada, France, Russia and Germany. The discussion here will primarily focus on British and related U.S. armor development in terms of special capabilities, and how these developments guided and informed Hobart and the 79th Division.

Due to the challenges the Allies would face in the planned invasion, not only would new equipment be required but so too would new tactics, procedures and organizations to put them into use. The key principle established by the COSSAC (Chief of Staff to the Supreme Allied Commander) planners was that invasion troops should have some sort of armor and mechanized means with which to attack German fortifications. The immediate challenge for Hobart was to determine the scope of the problem, assess the current state of specialized armor development, and decide how best to marry the two in as quick and efficient a fashion as possible. To this end he formed his unit around developing capabilities that would: land armor on the beach in the lead, clear the immediate beach obstacles, make the beach trafficable for follow-on forces, breach

the beach fortifications (natural and man-made), provide limited gap-crossing capability, and direct armored combat power at strongpoints and pillboxes. Hobart, with these essential tasks in mind, set about building a division that could meet such challenges.²

Hobart's plan was to cast a net wide to determine what capabilities already existed in the force, what was in development, and what was left in the realm of the possible, given that there was less than a year to the invasion. "He [Hobart] turned the division into a 'think-tank' for new ideas for armored weaponry."³ Hobart would issue the challenge to all his soldiers through the following directive, "Confronting us is the problem of getting ashore on a defended coastline. The success of the operation depends on the element of surprise caused by new equipment. Suggestions from all ranks for improvements in equipment are to be encouraged. To assist secrecy it is preferable for all ranks to have direct access to their CO [Commanding Officer] for putting forward their ideas."⁴ Hobart was both commended and condemned for his enthusiastic bottom-up approach. Though leaders at lower echelons often found themselves by-passed in the passage of information, a method usually frowned upon in the military, in the end the division commander's chosen course of business would bear results.

The Equipment

Perhaps the most recognized piece of specialized armor used in OVERLORD was the Sherman DD-tank (refer to Appendix A for photos of all specialized armor mentioned),⁵ due mainly to the fact that it was the only piece used on all invasion beaches. It was generally recognized that armor would have to get onto the beaches early and quickly. The question put to Hobart was how best to accomplish this task. The development of amphibious tank capability had been ongoing in Britain and the U.S.

since the First World War. As these two powers alternated as the lead nation in terms of capability, Russia, Japan and Germany also began to show interest. Yet no viable amphibious capability appeared until 1941, when a Hungarian inventor by the name of Nicholas Straussler, an engineer who had developed a number of armored vehicles in the inter-war years, designed a method by which any tank, to include full-sized battle tanks, could be made to float. Straussler's design was based on a collapsible canvas shroud, or screen, that was fitted around the hull and raised up to a height that would allow the tank to displace enough water to "float." The stability for this floatation shroud was provided by thirty-six airtight pillars, which were held up by collapsible metal struts. The other essential part of his design was a steering device that moved propellers fitted to the rear of the tank, connected to the gearbox. This innovation would allow tanks to swim ashore, prepared to enter battle by simply dropping the canvas screen.

Hobart was much impressed with Straussler's design, and would modify it through a number of trials so that it could be applied to the Sherman.⁶ The final version of the Sherman DD deployed on OVERLORD still had flaws, even though Hobart's division tinkered with it for months. Two drawbacks of note were, one, the shroud prevented the tank from firing while afloat (a desirable feature for many U.S. Army officers), and two, the fragility of the floatation screen begged for relatively calm conditions, conditions not typically associated with the English Channel. The 79th made the best of a difficult engineering endeavor, adapting battle tanks for a very unique mission--a mission that in hindsight would have been better served by purpose-designed and constructed amphibious tanks--and providing OVERLORD planners with at least the promise of early entry firepower. Ten units would eventually be trained and outfitted with

these tanks; five British, including the three original regiments of the 27th Armoured Brigade (4th/7th Royal Dragoon Guards, 13th/18th Royal Hussars, 1 East Riding Yeomanry), the Nottinghamshire Yeomanry and the 15th/19th Hussars; two Canadian, the 6th (1st Hussars) and 10th (Fort Garry Horse) Armoured Regiments; and three American, the 70th, 741st and 743rd Tank Battalions.

Notwithstanding the drawbacks of the DD-tanks, once combat power rolled onto the beaches, the next challenge posed would be the tens of thousands of mines and other obstacles sown by the German defenders. The 79th would need to perfect a capability to clear or at least reduce this threat. Various types of mine rollers, plows and flails had been experimented with since 1918. The proliferation of mines in North Africa in 1941-2 led to a renewed interest in mechanical mine-clearing capabilities. The best known development from this time was by a South African Army Major, A.S. Du Toit, who is generally credited for devising a mine flail to counter the increased mine threat. The design relied on a rotating drum suspended on arms in front of a tank. Short chains hung from the drum, with the drum itself powered by externally mounted engines. The intent was for the drum--and thus the chains--to spin around in front of the slow-moving tank, beating or clearing a path ahead. This version of the flail found some success in desert conditions while fitted the Matilda and Valentine tanks in Egypt.

Hobart put this idea to his developers, both military and civilian, for possible improvements for application in Normandy. The device was first modified to fit to the Sherman, as it was agreed that this would be the most capable common fighting platform. The arms were modified so that they could be moved to reduce possible obstructions to the driver's line of sight, and an improved drum and mechanism was devised. The last,

and most important modification would be in powering the drum from the tank's own engine, doing away with the cumbersome, and vulnerable, external power supply. Thus was born the Sherman Crab. Hobart was very enthusiastic as to the promise of this tank, and he pressed the War Office and industry to support his efforts to mass-produce them. The following excerpt of a letter from Hobart to the War Office demonstrates both his enthusiasm and his determined, often unpopular, straightforward approach: "There seems to be in some quarters a frigid attitude as regards mechanical matters. I believe this is due largely to inadequate coordination of the activities of designers, producers and users and insufficient drive behind design and production. In any case, the need is so acute that we cannot afford either to neglect or drop any possible method of dealing with minefields."⁷

In spite of Hobart's determination, the mine flail was not universally embraced, with many of the belief that mine plows or rollers were a better countermine alternative. One reason for this opinion was that the Crab created a large dust signature while flailing, particularly in dry conditions. The Crab also suffered from some performance limitations, as its guarantee of mine strike with a chain was not foolproof.⁸ Different plows were tested as possible alternatives, but none were found to measurably outperform the flail. One plow, the Bullshorn (a derivation of "bull's horn), did prove useful in sandy or loose soil conditions (as seen in the invasion beaches), and it was fielded on a limited basis. Mine rollers also had a group of supporters, and had been experimented with since the end of the First World War. The main problem with most roller designs was that they were large and bulky, awkward to maneuver, and prone to failure upon mine detonation (they couldn't sustain multiple strikes without becoming an obstacle themselves). One

roller, the CIRD (Canadian Indestructible Roller Device) was tried out by the 79th and adopted on a limited basis. There is, however, no record of its use in combat.⁹

The final type of mine-clearing capability that appeared during World War II was in the use of explosive charges. The adoption of the “Bangalore torpedo”¹⁰ as a means of hand-emplaced obstacle reduction was becoming more widespread. This demolition means, though effective, still meant that an engineer, or sapper, was exposed in the face of enemy fire while emplacing the charge (as well as from the blast created from the torpedo). Hobart was determined to mechanize the process, and one solution that was presented was the “Snake.” This was, in essence, a bangalore made large. The Snake was a 20 foot-long steel pipe filled with TNT, sections of which could be joined together and pushed through a wire or mine obstacle with a tank. Though more survivable than foot soldiers exposed in the open, this method took more time and was not particularly effective while under heavy enemy direct fire.

An alternative to this method were rocket-fired mine-clearing charges, a newly developed technology of the period, and precursors to the systems still in use today. One such system was called “Conger.” This piece of equipment consisted of a trailer-mounted, rocket-propelled hose (similar to a fire hose) that would be carried behind a battle tank. As the tank approached the obstacle the rocket could be fired from within, the hose would deploy, and would then be filled with a nitroglycerin solution pumped from the trailer. This method, though effective in producing enormous explosions that cleared wide swathes, was deemed too unstable and dangerous to be widely fielded.

The next key piece of equipment that would be unique to the division was the Churchill Armoured Vehicle, Royal Engineer (AVRE). The purpose of this tank would

be to give engineers a more survivable platform from which to conduct the missions expected of them during OVERLORD and beyond. The essential difference between the AVRE and a standard Churchill tank was that the main gun was removed and replaced by a device referred to as a “mortar, recoiling spigot,” or more colloquially a “Petard.” This special mortar bore more than a passing resemblance to the British infantry’s PIAT, largely because it was developed by the same man.¹¹ This mortar could hurl a 40-pound explosive, finned bomb over seventy meters to its target, likely a bunker or pillbox.¹² The Petard mortar would later be referred to by many soldiers as the “flying dustbin,” partly due to its ungainly appearance and flight, but also due to the smoke, dust and rubble created on the receiving end.

Another advantage of the AVRE was the flexibility it provided and the number of different roles it could assume. More than just a combat engineer tank, the AVRE could be outfitted with fascines, strapped to the top of the hull, which could be used to bridge small gaps. The AVRE could also be fitted with a Small Box Girder (SBG) bridge, capable of spanning a gap of over thirty feet. This tank-launched bridge design was inspired by the Royal Engineer tank, introduced at the end of the First World War. The hinged scissor bridge, though ungainly in appearance, worked well and could support a load of forty tons. The AVRE was also equipped with brackets and attachment points that made it possible for other pieces of equipment, like plows, rollers, or “bobbins,” to be attached to it. The AVRE was a 79th Division success story, with many of the design innovations carried out by its Royal Electrical and Mechanical Engineers (REME) workshops. Hobart would hand the task back to the War Office and industry to produce in quantity the necessary conversion kits.¹³

AVRE launched fascines and bridges could not totally solve the problem of dry-gaps and walls. Another capability had to be introduced that would allow tanks to scramble over the sea walls and larger dry canals and ditches of northern France. This capability would become known as the Churchill ARK (Armored Ramp “Carrier”). The ARK was a Churchill tank without a turret. In the place of a turret were laid two timber trackways, with extension ramps secured to either end. The idea behind the ARK was that it would move to the base of the sea wall, drive up it as far as possible, and deploy its hinged ramps from either end. This provided follow-on armor a stable platform from which to exit the beach. If the sea wall had a drop-off on the other side, and not some sort of promenade, an AVRE with fascine could be sent up first and drop its load onto the far side, providing a base on which to drop down on. The division found other uses for the ARK too. Upon coming to a dry gap or large ditch, the ARK could slowly ease into it, and then deploy its ramps so that they would touch down on either side, providing a type of ready bridge. If the gap was deep, some units found that one ARK could be driven on top of another, until the right depth was achieved. These modified tanks would prove very useful, and durable, during the upcoming drive across France.

Another piece of equipment that found wide acceptance and a number of uses was the flamethrower tank. These tanks, again introduced in World War One, had been developed by a number of countries in the inter-war years, with Britain, the United States, Russia, Germany, France, and Canada all producing models. The Canadian tank during World War Two, nicknamed the “Ronson,” was especially popular and was adopted for use by the U.S. forces in the Pacific Theater. The British Army had been perfecting a model since 1938, and in 1942 adapted the technology to Valentine tanks.

This model had an armored trailer that, through pressurization, would force fuel to the turret-mounted gun. It had a limited range and could not sustain the flame for long, both key shortcomings. The 79th Division would work with combat developers from the Petroleum Warfare Department and adapt the system to the Churchill tank. The tank would be accepted into the division in the fall of 1943, code-named the Crocodile. The only marked difference in the Crocodile from a normal Churchill tank was that the hull machine gun was replaced by a flame projector. 400 gallons of thickened gasoline still trailed behind in an armored trailer, pressurized by cylinders of compressed nitrogen. The Crocodile, as finally fielded, had a range of 110 meters and a duration of eighty seconds of fire. One of the original Crocodile tank commanders, Lieutenant Andrew Wilson of The Buffs, described the noise of its firing “like the slapping of a thick leather strap.”¹⁴ When the Crocodile had accomplished its flame mission it could disconnect the trailer and continue with its main battle tank mission.

One piece of equipment that showed great promise, never realized, was the Canal Defense Light, or CDL. Based on an idea first proposed, again, during World War One, the CDL was a tank with a high power light mounted on its turret. The original intent was for the light to be so intense that it would blind the enemy to its attackers. The idea, as it evolved in the 1930s, was for the intense light beam to flicker in a strobe effect, believed to intensify the blinding effects. The name of the device was misleading, purposely made so to confuse people and ensure the project remained shrouded in secrecy. While a number of tanks, and later entire brigades, were outfitted with the lights, they were never used for their intended mission, perhaps in part due to the misunderstanding of the CDL

name – a secret that worked too well. The CDL did see limited action later in the war, as will be shown in later chapters.

Most of this unique equipment, based on early prototypes and existing capabilities, was improved upon for final fielding in the workshops and through the efforts of the 79th Division. It was a marriage of embracing off-the-shelf technologies with the freedom to tinker and experiment. And it did not take long for Hobart's energies, enthusiasm and invective to be felt both within and outside the division. His earlier encouragement of his soldiers to make "suggestions for the improvements to equipment and techniques" bore fruit quickly.¹⁵ A number of useful suggestions for equipment modifications and new tactics for AFV employment resulted from his command directive. Hobart's dark side would show itself on occasion, usually reserved for those who could not, or would not, contribute to the process. Many staff officers would find the division's "revolving door" as they came and went throughout 1943 and early 1944. One of his brigade commanders aptly noted that Hobart "was a constant inspiration, and irritation, to his subordinates."¹⁶ Industry did not escape his gaze or wrath if requirements or suspenses could not be met. One industrialist who found an appreciation for Hobart's unique methods, Sir Miles Thomas of the Nuffield Organisation, said that, "It is sometimes said of inventors that they don't have to be mad to create ideas--but it does help. I wouldn't accuse Hobo of any form of madness, but he certainly had applied ingenuity....he not only thought up original ideas but he helped considerably in their realization--and this in the face of discouraging criticism."¹⁷ Most leaders of industry, however, resented his interference, and as such, his impatience and drive for perfection would cause him to look inward to the division for solutions to most challenges they

faced. As soon as REME workshops were assigned to the division he put them to work on fabricating many of the designs and variants that would eventually be passed to industry for mass production.

The United States had also been developing specialized armor, but not to the extent of British efforts. One piece of equipment that was unique to the U.S. Army, and proved popular and successful, was the Sherman ‘Tankdozer’. This vehicle combined the work capacity and utility of a bulldozer with the survivability and firepower of a tank. The tankdozer was developed by the Corps of Engineers, in close cooperation with a number of potential manufacturers. The idea for the tankdozer had been around since the beginning of the war, but a pilot model wasn’t developed until June 1943, with production following in December of that year. It would prove useful in campaigns in Italy and northwest Europe. The British were so impressed with the tankdozer that they requested 100 of them for use on their invasion beaches to replace and/or supplement the lightly armored bulldozers that were found lacking in comparison.¹⁸ U.S. armor developments were limited though, with nothing comparable to the scale or organization of the 79th Division. It seemed to be the opinion of most U.S. Army leaders that such equipment was unnecessary, and as Russell Weigley has noted, “Their [British] caution and their inability to afford heavy casualties often tempted the British into an entanglement with military gadgetry of varying utility.”¹⁹ The American way called for the determination and grit of the front-line soldier to face the challenge head-on.

The Training

Hobart’s first priority would be to secure the necessary training areas for the division to test and trial its new equipment, and subsequently train its crews on newly

developed invasion techniques and procedures. Two major land-based training areas were quickly secured for use by the division. The first training area was west of Orford, in Suffolk, and offered the division ample maneuver space, while also providing relative seclusion, as the desire for secrecy was still very high. This site was made possible through relocating area residents to other locales, a practice that was becoming more and more common as increasing amounts of soldiers staged in Britain and training intensified. The Orford site would serve as the primary training and testing site during the August and September 1943 trials.²⁰ A second training area was established at the Royal Air Force site at Linney Head in South Wales. This site would be used for some maneuver trials, but its primary function was as a live fire area for the unit's tanks--allowing crews to hone marksmanship skills with both the 75-millimeter tank main gun and the AVRE petard.²¹

Special training sites would also be required for testing the DD-tanks. Sea trials for these tanks were conducted first in Scotland, then Wales, and finally in South Dorset. A DD instructional wing (A Wing) was first established at a secret location known as Fritton Decoy (Lake) in Norfolk. It was here that the first real fresh water testing and training for these tanks would occur. This would be the first of many instructional wings that Hobart would create, always internally operated organizations that used the best equipment and personnel to meld equipment training and development. It was here at A Wing that instructional methods and DD-tank development were honed and refined. The first DD-tanks, older Valentine models, were modified as necessary at on-site workshops established by the division. Plans were drawn and presentations were given to industry representatives. It was through initial efforts here that the final plan for the Sherman DD

was born, and the draft employment drills (including all important launch and escape drills) were codified.²²

It was in the south of England that the division honed its procedures in the deployment of the DD-tank. It was here in the Solent, at Stokes Bay, that the B Instructional Wing was established and was operational in October 1943. The division staff and leaders worked closely with the Royal Navy in the Solent from January to May 1944 perfecting DD-tank loading and launch techniques. All of the DD-equipped Allied tank battalions would come through this site for training prior to the invasion. Over 30,000 launches were conducted as the DD-tank training came to a close in May, and amazingly, only one fatality had resulted from the intensive training.²³ It was during this period that the division also began working with the Combined Operations Experimental Establishment (COXE) in North Devon to validate the invasion landing craft loading procedures that had been developed with the Royal Navy. These trials would serve to inform the large-scale combined arms exercises conducted just prior to the invasion.²⁴

The challenge next faced by Hobart and his staff would be in coordinating the training effort. Though the greatest concentration of units, including most of the 30th Armoured Brigade, were located at the Orford training area, smaller units were conducting individual tests and trials on their unique equipment throughout much of Britain. Most of these units were at secretive locations, making it even more difficult to coordinate movement and logistics, as so few people were allowed access to or knowledge of the training. Hobart and his staff found themselves continually on the road, both overseeing development of the equipment and standardizing training methods and techniques across the division. It is further testament to the energy and drive of Hobart

that development and training was able to progress as quickly, efficiently and effectively.²⁵

As training and development of the equipment began to progress satisfactorily by the end of 1943, collective training began to be conducted. Initially, units had conducted training on the unique pieces of equipment assigned them. Small-scale collective training, using a mix of the specialized armor, was conducted at both the Orford and Linney Head training sites in late Fall. These training events enabled the division's leaders to determine the best approach to take in coordinating the amphibious breach effort. The 30th Armoured Brigade commander, Brigadier Nigel W. Duncan, noted, "for the first time all the component parts saw themselves in action as part of a connected whole and outside commanders were given an inkling of the support they could expect from units of the 79th Armoured Division operating with them."²⁶ These smaller exercises led to a number of larger divisional exercises at the Orford site in early 1944. These training exercises included Elk II (January), Bullshead (March), and Smash (April). These exercises proved important as crews gained more confidence and proficiency, and unforeseen equipment problems could be addressed and corrected. These exercises also provided Hobart a forum to demonstrate his unit's capabilities to a number of VIPs (including Churchill, Alan Brooke, Eisenhower, and King George VI), as well as finalize the tactics, techniques and procedures to be used in the invasion.²⁷

These exercises (or "demonstrations") supported Hobart's other major training priority, to educate senior leaders and officials as to the unit's scope and capabilities. He did this to both help in securing continued resources, as well as ensure that the division's soldiers would be properly employed upon integration into the invasion force. As his

biographer, Macksey, notes, “To Hobart, the problem of adapting men to machines, and machines to overcome the German defences, almost took second place in educating the senior, orthodox Army Commanders and the Captains of Industry to the demands of specialised armour.”²⁸ To this end he first demonstrated his division’s capabilities to Montgomery in the winter of 1943. Montgomery was pleased with the progress the 79th had made and he ordered Hobart to make up to one-third of the division available to the Americans for the invasion.²⁹

Hobart sought to enlist U.S. interest as ordered by Montgomery and arranged for General Eisenhower, accompanied by Field Marshal Alan Brooke, to visit the division’s training area in Orford. They conducted the visit on 26 January 1944, interested in hearing from Hobart how his efforts were progressing and so too to view a demonstration of various pieces of equipment. Hobart led them through a series of briefings on tactics developed for the employment of these new capabilities, and they toured some of the mock-up training models developed to rehearse likely tactical scenarios (beach obstacles, minefields, walls, ditches, pillboxes). The highlight of the visit was the demonstration of the units and their unique equipment. These demonstrations included breaching with Crabs, lane marking, the Bullshorn Plow, the ARK, the Small Box Girder Bridge, the “Wurlitzer,” “Snakes,” Crocodiles, DD-tanks, AVREs, and a full-scale combined arms breach rehearsal using most of these vehicles. The visiting party, in particular Eisenhower, was impressed and excited by what they saw.³⁰ Upon his return Eisenhower would recommend to Bradley that he take advantage of some of these new British capabilities for use on the American invasion beaches.³¹

The final element of the division's training came in late April and May 1944 when the unit participated in the final, large-scale pre-invasion exercises. By this time most of the units who would participate in OVERLORD had integrated into the assaulting divisions they were to support. These exercises, most notably FABIUS and TIGER, allowed the division's leaders to confirm the concept for the use of specialized armor that they had envisioned. FABIUS, conducted on 3 May, was important for it would serve as the final full-scale loading exercise for the invasion landing force.³² These last exercises were also the final rehearsals for a very complicated operation, and a number of synchronization problems and points of detail were corrected that would prove critical to OVERLORD's eventual success.³³

The U.S. Army's efforts to codify and standardize amphibious training had begun early in the war, with an Amphibious Training Center (ATC) established at Camp Edwards, Massachusetts, in June 1942. This center, and its successor site, Camp Gordon Johnston in Carrabelle, Florida, were established to "develop the proper organization, equipment and technique and to whip the first units into shape as operating units capable of successfully landing troops on enemy shores and then unloading supplies and reinforcements to keep them there."³⁴ The ATC was disbanded the following year as it was determined by War Department leadership that the Navy should have the lead on all amphibious training. The ATC staff was successful in training four infantry divisions in its year of existence (45th, 36th, 38th, and 28th), and was able to write a good deal of doctrine and procedures, much of which would be used at the Navy's training centers. What was lacking at the Army's training centers, which the Navy was able to later

incorporate, was a joint and combined arms focus that focused on penetrating a defended coastline.³⁵

Some Americans, other than Eisenhower, were inspired by the British efforts at specialization, including then-Lieutenant Alfred G. Hoel of the Corps of Engineers. Following a visit to some of the first-established amphibious training areas in England, Hoel proposed a similar establishment for the U.S. Army. He was able to develop an engineer training site at the Navy's Amphibious Training Base at Fort Pierce, Florida. It was here that the first model of the tankdozer would be tested, and through Hoel's (and later Lieutenant-Colonel James Walsh's) efforts an engineer armored vehicle would also be developed. This vehicle was a modified tankdozer, very similar in capability to the AVRE. Although the Engineer School and Board demonstrated the vehicle's utility to the War Plans Division, the planners believed the vehicle could not fit into the existing force structure. As no one was willing to establish a U.S. Army equivalent to the 79th Division, armored engineer vehicles were never produced in quantity and by the time a handful appeared at the docks, the war was over.³⁶

The Fort Pierce Amphibious Training Base was also similar to the 79th's training sites in Orford and Linney Head in other ways. Each site provided accurate replications of the invasion beaches soon to be encountered, complete with the expected obstacle array. The Fort Pierce site was so well received that its model was copied and exported to Woolacombe Sands, England in April 1944, where it would be designated the Assault Training Center (ATC). Under the direction of then-Lieutenant Colonel Paul Thompson, the ATC would develop training methods for OVERLORD, and would be one of the key sites where final invasion preparations would be conducted.³⁷ Lieutenant Colonel

Thompson and his staff worked closely with both invasion planners and 79th staffers to refine techniques and procedures and experiment with assault methods that would best suit the needs and capabilities of the lead assaulting divisions. Thompson would put these techniques into practice in a few short weeks while commanding the 6th ESB (Engineer Support Brigade) at OMAHA beach.³⁸

Although there would be great similarities to the training approach at these sites, the U.S. and British “doctrinal” solution for the amphibious operation would diverge as to the scale of reliance upon technology to “penetrate the crust.” The British insistence on a mechanized solution to overcome this challenge, spearheaded by the 79th, was not deemed suitable by U.S. Army leaders and planners. The British approach taken by the operational commander, Montgomery, was to hand the beach obstacle problem over to Hobart, provide him maximum support, resources, and leeway to find a solution. The U.S. operational commander, Bradley, vacillated as to the best solution to the problem--even considering obstacle reduction through air and naval firepower--before finally handing it off to one of his subordinates, General Leonard T. Gerow, commander of the U.S. V Corps, as late as March 1944.³⁹

Gerow was not comfortable with the invasion plan for the U.S. beaches, specifically, OMAHA, and felt that air and naval fires alone could not be relied upon to clear obstacles on such a broad front to the scale required. As such, the obstacle clearance plan was therefore thrust back into the hands of engineers (army and naval) who would be required to clear lanes by hand. Responsibility for clearance had to be determined as well. The Navy would be responsible to clear to the high water mark, and the Army would clear from that point inland as far as necessary, not a very clean arrangement. To

accomplish this task a Provisional Engineer Group was established 30 April 1944, just weeks before the invasion. Training primarily at Woolacombe, the unit, comprised of a number of various engineer Army and Navy battalions, companies and teams, would be charged with clearing the gaps on the American invasion beaches. U.S. command indecision meant that, “A mere six weeks prior to the invasion of Europe, personnel were still being identified to perform a critical mission, and the army was conducting not only unit training but also individual training to teach soldiers and sailors basic skills and techniques for using explosives to remove obstacles.” However, the unit was composed of experienced engineers who had participated in ATC training, and was commanded by LTC John T. O’Neill, an engineer battalion commander well versed in the latest amphibious assault breaching techniques.⁴⁰

Hobart and his division had last-minute challenges of their own, other than the inability of industry to quickly deliver armor in the desired quantity. One unique challenge was the issue of the soil composition at the planned British assault beaches. A secret mini-sub reconnaissance, conducted on 17 January 1944, determined that soft blue clay was in abundance as geologists had in fact predicted, and that it would likely impede trafficability. Hobart’s team quickly found a British beach that had similar characteristics, and they began developing a capability to overcome the problem.⁴¹ What resulted was the “Bobbin,” a modification of an earlier carpet-laying Churchill tank outfitted with a large spool of hessian cloth reinforced with strips of wood. The running end of the roll was weighted and when released it dropped down in front of the tank, and the matting would then spool out as the tank slowly drove forward. The “Bobbin” carried about 100 feet of material and was about ten or eleven feet wide, usable by most vehicles in the inventory,

but unlikely to stand up to heavy tracked traffic.⁴² This is probably the best example of the ability of this purpose-built organization to quickly adapt to an unforeseen challenge, and in the importance of having leaders able to respond accordingly, with drive and imagination.

As last minute invasion planning came to a close in late spring, the only piece of British equipment that seemed to interest Bradley and most American planners was the DD-tank, even though General Eisenhower had been more enthusiastic. There has been some discussion and opinion as to why this was so, with a number of reasons proffered. One reason given was that there was no time to train American crews on the Churchill tanks, even though Crabs were fitted to Shermans and required very little special training.⁴³ Another reason many historians have mooted may be a combination of the ‘not made here’ attitude, and the reluctance on many (infantry-centric) U.S. Army leaders, Bradley included, to rely too much on armor. Bradley himself states that the reason for refusing the offer was that most of the equipment was based on the Churchill tank. His point was that, “accepting the Churchills would require retraining our tank operators and maintenance men and a complicated separate supply chain for spare parts,” and that “had the ‘funnies’ been conceived earlier, in time to adapt their gadgetry to Sherman tanks, we would probably have made use of them.”⁴⁴ Bradley wrote this in spite of the fact that he approved his own First Army staff’s recommendation to adopt the 79th’s amphibious, flamethrower and bulldozer tanks.⁴⁵ This recommendation had been made by a board chaired by the First Army ordnance officer, Colonel Medaris, who had been looking into the issue of adopting British specialized equipment.⁴⁶ Why the final decision was made to

forego their use on American beaches remains unanswered, and based on the events that transpired at OMAHA Beach, quite controversial.⁴⁷

This reluctance on the part of some U.S. Army leaders to try out new ideas and techniques was also apparent in the reception given Major General Charles “Pete” Corlett, upon his arrival in theater from the Pacific. Though admittedly not a fan of DD-tanks (he, like the British Admiralty, thought they were too risky), Corlett firmly believed in incorporating some form of firepower early into the amphibious assault, as he had seen done in numerous campaigns in the Pacific. Corlett was also a strong proponent of “rugged amphibious equipment” that could lead in the assault, potentially reducing the loss of life from plans over reliant on human waves alone. The British found his experiences and ideas very interesting and would use them to hone the final months’ training. “But Corlett did not find the Americans receptive in the way Marshall had intended. Instead, they seemed to dismiss the Pacific as the bush leagues, and ‘I [Corlett] felt like an expert according to the Naval definition, a son-of-a-bitch from out of town.’”⁴⁸ It seemed the Army leaders were not yet interested in these men of vision, be they British or their very own countrymen and peers.

It is likely that a combination of factors led to the U.S. refusal to accept anything but the DD-tanks, some attitudinal, and some hard fact. It was getting late in the planning process to make changes to what had already become perhaps the most complex military operation mounted to that time in history.⁴⁹ As has been shown, however, U.S. planners were still making significant changes to critical aspects of the invasion plan as late as the end of April. The slippage of D-Day by one month had been fortuitous in this regard. Nevertheless, the British and American approaches to penetrating the German coastal

defenses would remain divergent. While U.S. invasion forces would be dependant upon the hand-emplaced charges of engineers exposed to direct fire, the British would commit to their plan to use the new, “secret weapon” of specialized armor. Tactical success would be achieved on all of the beaches, but at quite a different cost.

¹Gilbert, 993.

²Chester Wilmot, *The Struggle For Europe* (New York: Harper & Brothers Publishers, 1952), 182.

³Patrick Delaforce, *Churchill's Secret Weapons* (London: Robert Hale, 1998), 61.

⁴*Ibid.*, 65.

⁵Unless otherwise noted this sub-section relies on common information contained in the following works: Ian V. Hogg, *Armour in Conflict: The Design and Tactics of Armoured Fighting Vehicles* (London: Jane's Publishing, 1980), 155-9; Hunnicutt, 394-471; Ian V. Hogg and John Weeks, *The Illustrated History of Military Vehicles* (Englewood Cliffs, NJ: Prentice Hall, 1980), 229-247; Chamberlain and Ellis, *The Sherman*, 19-26; David Fletcher, *The Great Tank Scandal: British Armour in the Second World War (Part One)* (London: Her Majesty's Stationery Office, 1989), 119-137; and David Fletcher, *The Universal Tank: British Armour in the Second World War (Part Two)* (London: Her Majesty's Stationery Office, 1993), 28-57.

⁶Richard M. Ogorkiewicz, *Armoured Forces: A History of Armoured Forces and their Vehicles* (New York: Arco Publishing Company, 1970), 407-22.

⁷Macksey, *The Tank Pioneers*, 204

⁸Hunnicutt, 444.

⁹Hogg, 156.

¹⁰The Bangalore torpedo was a British invention resultant from the Indian theater during World War I. They have developed over time but generally consist of a demolition-filled tube (around four feet long) that can be connected and “slid” through an obstacle (wire or mine).

¹¹General Sir Millis Jefferis was principally responsible for the invention of the PIAT and the Spigot Mortar. See Macrae, *Winston Churchill's Toyshop*.

¹²This device would provide the inspiration for the U.S. Army's later development of the M60 CEV (Combat Engineer Vehicle).

¹³Hogg and Weeks, 239.

¹⁴Richard Collier, *D-Day, 6 June 1944: The Normandy Landings* (New York: Abbeville Publishing Group, 1992), 112.

¹⁵Macksey, *The Tank Pioneers*, 204.

¹⁶Nigel W. Duncan, *79th Armoured Division: Hobo's Funnies* (Windsor, England: Profile Publications, 1972), 1.

¹⁷Macksey, *Armoured Crusader*, 252.

¹⁸This is based on SHAEF message traffic from 4-12 March 1944 (See SHAEF, SGS Records, Roll #13, #322, 21 Army Group, Org & Admin, 1325-1413). The British request could not be filled due to limited quantities in production in the United States at the time – and the last-minute surge requirement for Sherman DDs also being filled.

¹⁹Russell Weigley, *Eisenhower's Lieutenants: The Campaign of France and Germany 1944-1945, vol. 1* (Bloomington, IN: Indiana University Press, 1981), 67.

²⁰*The Story of the 79th Armoured Division*, 11.

²¹Fletcher, *Vanguard of Victory*, 30.

²²Duncan, 14-19.

²³*The Story of the 79th Division*, 15.

²⁴Fletcher, *Vanguard of Victory*, 35.

²⁵*Ibid.*, 17.

²⁶Duncan, 16.

²⁷Delaforce, 76.

²⁸Macksey, *Armoured Crusader*, 246.

²⁹Wilmot, 265.

³⁰Harry Butcher, notes from private diary, Office C-in-C, Book X, pp. A-1022 – A-1026. Butcher Diary Series, Box #168, Eisenhower Presidential Library; and Dwight D. Eisenhower, *Crusade in Europe* (Garden City, NY: Doubleday & Company, 1948), 236-7.

³¹David Eisenhower, 176.

³²FABIUS was the large full-scale exercise for all assault for except Force U. Force U conducted a separate exercise, TIGER, at Slapton Sands, and became infamous when German U-boats eluded the naval covering force and sunk a number of the amphibious landing craft. A number of costly lessons in ground-naval communications were learned as a result, though would not be fully applied to the execution of OVERLORD the following month. See Ken Small and Mark Rogerson, *The Forgotten Dead*; and Nigel Lewis, *Exercise TIGER*, for excellent accounts of the tragedy.

³³Delaforce, 88; and the *79th Armoured Division Final Report*, App. E (73-76), for the final LCT load plan SOP decided upon for the division.

³⁴William F. Heavey, *Down Ramp: The Story of the Army Amphibian Engineers* (Washington, DC: Infantry Journal Press, 1947), 9.

³⁵Marshall O. Becker, *The Amphibious Training Center, Study no. 22* (Washington, D.C.: Historical Section, Army Ground Forces, 1946).

³⁶Blanche D. Coll, Jean E. Keith and Herbert H. Rosenthal, *U.S. Army in World War II. The Technical Services. The Corps of Engineers: Troops and Equipment* (Washington, DC: U.S. Army, Office of the Chief of Military History, 1958), 468-482.

³⁷Jonathan Gawne, *Spearheading D-Day: American Special Units of the Normandy Invasion* (Paris: Histoire and Collections, 1998), 6.

³⁸Adrian R. Lewis, *OMAHA Beach: A Flawed Victory* (Chapel Hill, NC: University of North Carolina Press, 2001), 108.

³⁹*Ibid.*, 195.

⁴⁰*Ibid.*, 199.

⁴¹Collier, 112.

⁴²Hogg, 156.

⁴³Wilmot, 265.

⁴⁴Omar N. Bradley and Clay Blair, *A General's Life: An Autobiography by General of the Army Omar N. Bradley* (New York: Simon and Schuster, 1983), 248. His statement here is a bit misleading, and he may be defending a poor decision made prior to the invasion. The Americans did not have to accept only the new vehicles, as entire subunits were offered up for use on the American sector invasion beaches, a point that would counter Bradley's concern of supply and training. Bradley certainly became interested in, and used, many of these vehicles post-OVERLORD, as is shown in later chapters.

⁴⁵Report, Kean to CG, 21 Army Group, 14 Feb 44, sub: Committee Proceedings on Special Equipment, U.S. Army, 12th Army Group, 337 Conferences, Records Group 331, NARA.

⁴⁶Letter, Medaris to CG First U.S. Army, 2 Feb 44, sub: Adoption of Specialized Equipment for Use Within First Army, and Incls, 12th Army Group, 337 Conferences, NARA.

⁴⁷David W. Hogan, Jr., *A Command Post at War. First Army Headquarters in Europe, 1943-1945* (Washington, DC: U.S. Army, Center of Military History, 2000), 40.

⁴⁸Weigley, 68-9.

⁴⁹Just a few of the historians who have offered opinion on this issue include: D'Este in *Decision in Normandy* and *Eisenhower*, Hunter and Brown in *Battle Coast*, Weigley in *Eisenhower's Lieutenants*, and Brooks in *The Normandy Campaign*.

CHAPTER 3

INVASION

I have heard a lot about how you deal with the obstacles you expect, but what you must be ready for is to get through whatever you encounter. You may be landed anywhere because those in charge of landing craft are even more amateur sailors than you are amateur soldiers.¹

Major-General Hobart

The 79th Division was as prepared as time and equipment limitations allowed as OVERLORD's June invasion date neared. Hobart made a last tour of the southern English ports, visiting his subunits--already task organized into the assault divisions--and reminded them one last time of their immediate task and challenge (as the quote above demonstrates). He again reminded soldiers of their mission, to provide armored obstacle clearance support to the lead assault brigades, and direct fire support as necessary. These visits were significant as most of the division's subunits would be detached to maneuver units, and these last minute speeches would serve to confirm the commander's final guidance and intent, therefore it was critical that each soldier understand what was required of him, and the significance of their role in the overall plan. Brigadier Duncan, whom Hobart had grown to trust and rely upon to an increasing degree, would be in command of the divisional units once the initial assaults had been completed.

The 79th Division's task organization for the assault had proceeded very smoothly. Much of this success can be attributed to Hobart's focused efforts to educate and liaise with maneuver commanders throughout, a process that had begun in earnest six months earlier. He provided each assaulting division and separate brigade with liaison officers (LNOs). These divisional LNOs served two key purposes; one, they educated the

supported division's leaders on the unit's capabilities and limitations, and two, they were a timely conduit of information to Hobart. Hobart used these LNOs to maintain some control of his units, as they were never attached to the assaulting divisions, but remained in what can be best described as a direct support role for the invasion. Hobart and staff would rely upon the supported units to care for and employ the 79th subunits accordingly. As such, Hobart, through his role as Specialized Armor Advisor to Montgomery², actively ensured his subunits were properly integrated and cared for, and most important to him, employed in accordance with the newly-established drills, tactics, techniques and procedures. Duncan was Hobart's equal in the ability to effectively communicate this position to the supported maneuver units.

The final, agreed invasion plan found the 79th's units detached into the assaulting divisions as shown in Table 1 (also see OVERLORD Invasion Map at Appendix C).³ This table includes the DD-equipped battalions (regiments), planned to lead the assault, as well as the beach clearing and opening teams (Crabs and AVREs). The assault landing craft were loaded by team, one team per landing craft, with the aim that Crabs would alight first and flail a lane on the beach to the sea wall or the first vehicular obstacle. AVREs would follow and emplace either fascines or bridges to allow movement over the walls, craters or ditches found on most of the British beaches (See Appendix D, Figure 16, for a graphic representation of the beach lane opening plan). On sections of GOLD Beach the AVRE Bobbins deployed first because of the blue clay trafficability problem discovered on earlier reconnaissance. This "team loading" concept had been rehearsed throughout the April and May exercises, and was tailored to the unique characteristics of each beach. The final load plans would be adjusted to fit in LCT IV models, meaning

some of the loads would be very crowded (See Appendix D, Figure 17, for the final LCT loading plans used on the invasion).⁴

Table 1. 79th Division Support to OVERLORD Invasion Forces

Beach	Formation	DD-tanks	Crabs	AVREs
SWORD	3rd British Div 8th Inf Bde	4th/7th Royal Dragoon Guards Nottinghamshire Yeomanry	A Sqdn, 22 Dragoons	77 Sqdn, 5 Asslt Regt RE 79 Sqdn, 5 Asslt Regt RE
JUNO	3rd Canadian Div 7th Canadian Inf Bde 8th Canadian Inf Bde	6th and 10th Canadian Armoured Regts	B Sqdn, 22 Dragoons (+ 12 crabs from 21 Sqdn, Westminster Dragoons)	26 Sqdn, 5 Asslt Regt RE 80 Sqdn, 5 Asslt Regt RE
GOLD	50th (Northumbrian) Div 69th Inf Bde 231st Inf Bde	13th/18th Royal Hussars	C Sqdn, Westminster Dragoons B Sqdn, Westminster Dragoons	81 Sqdn, 6 Asslt Regt RE 82 Sqdn, 6 Asslt Regt RE

The description of the crossing has been well documented in many official accounts, and to be sure the division's troops suffered force four (and worse) sea conditions in the same fashion as all others crossing the Channel, in the early morning on 6 June. The key aspect of the rough sea conditions would be the impact on DD-tank employment, and could either delay the landings or imperil them altogether. Hobart believed that the success of the specialized armor teams depended upon the supporting firepower provided by the Sherman DDs.

The plan followed that if the DD-tanks did not make it to the beach, or were delayed (timings were very tight, the plan was for the teams to follow right behind the DDs), the crews of the Crabs and AVREs understood their task would be made more difficult and dangerous. In lieu of DD-tank support, specialized armor crews would be

forced, in varying degree, to assume a direct fire support role. Although these crews were proficient in their tank gunnery skills, this additional task would complicate their primary mission of beach clearance. On most beaches this would come to fruition, and Crab and AVRE tank crews would have to both clear obstacles and fire themselves onto the beaches. As the following beach-specific narratives show, these crews were successful in performing this dual role, usually resulting in no significant delays to the inland assault plan.

Many Allied leaders believed that the effect of the DD-tank's firepower on the vanguard of the assault would be accentuated by the psychological, or "shock," effect on German gunners surprised by the appearance of these "secret" weapons. If this account of a DD-tank sergeant is to be taken for face value as the norm, then perhaps high command's views were valid:

I was the first tank coming ashore and the Germans started opening up with machine-gun bullets. But when we came to a halt on the beach, it was only then that they realized we were a tank when we pulled down our canvas skirt, the floatation gear. Then they saw that we were Shermans. It was quite amazing. I still remember very vividly some of the machine-gunners standing up in their posts looking at us with their mouths wide open. To see tanks coming out of the water shook them rigid.⁵

It is debatable whether or not the tanks significantly "shocked" the German defenders. What cannot be discounted is the positive effect the armor had on the friendly infantry that was left exposed on the open beaches. Whether from Sherman DD-tanks or Churchill Crabs and AVREs, the psychological impact of armor would significantly impact numerous small unit actions.

GOLD Beach

On GOLD Beach the initial infantry assault went in without DD-tank support, as the 4th/7th Royal Dragoon Guards decided that sea conditions were unfavorable for launching, and that the tanks would go ashore in their LCTs. The Nottinghamshire Yeomanry would launch their tanks, but rough seas slowed their progress, and eight tanks foundered enroute. Now in the fore of the invasion, the lead assault teams found that when they landed the fire was intense, particularly at Le Hamel. Four of the first five flail tanks from B Squadron, Westminster Dragoons that disembarked were destroyed, and out of the squadron's nineteen original tanks, only five were functioning later in the day. As would be the case on all the beaches, sheer numbers of tanks and infantry would be required to overwhelm the German defenders.⁶

A 75-millimeter battery and 88-millimeter gun emplacements on GOLD Beach, at La Riviere and Le Hamel, proved troublesome to these first assaulting waves. Air and naval bombardment had proven ineffective in reducing these gun positions, as their casements were strongest on the seaward side. German gun embrasures were sited to cover the beach at the high water mark, and they could enfilade the entire beach. With the DD-tanks delayed due to rough seas, the Sherman Crabs and Churchill AVRE crews found themselves using their main guns to attempt to silence the German emplacements. They were assisted in the Le Hamel area by an armored support group of Centaur tanks, offshore lashed into LCTs. These tanks were to provide direct fire support to the assaulting Royal Marine (RM) Commando, and achieved limited effectiveness in suppressing some of the German gun positions. After a number of tanks were knocked out of action, 75-millimeter tank fire from the Westminster Dragoons and 290-millimeter

petard mortar fire from the Royal Engineers finally reduced each of the German guns, and left GOLD Beach clear of the deadliest direct fire. Before midday, the specialized armor had cleared seven exits on GOLD and begun route clearance inland to follow-on objectives.⁷

Many of the German minefields on this Beach proved ineffective, either because the mines themselves malfunctioned, or the minefields were located in wet, swampy areas that were untrafficable. On the beaches, the Germans employed a great many mines of Belgian origin that did not explode, perhaps because of the corrosive seawater. The other trafficability issue was the blue clay, for it was here on GOLD Beach (vicinity La Hamel) that the clay had been previously detected. Accordingly, the AVRE Bobbins were first off the LSTs. Although a number of vehicles were to become bogged down, the 82nd Assault Squadron RE was successful in laying carpet over the clay to open one lane, and the follow-on Crabs were eventually able to flail exits from GOLD Beach.⁸

On GOLD Beach in the vicinity of La Riviere, 1200 yards of beach had been cleared by dusk, and up to two miles the following night. This was accomplished with similar results on most of the three British beaches using a combination of AVREs and armored bulldozers. The British were not able to secure Sherman tankdozers from the Americans due to shortages across the army. As a result they deployed armored Caterpillar bulldozers in follow-on assault waves specifically for the beach clearance task. The armor provided some protection for the operator, less exposed than the bulldozer operators on the American beaches, almost all in open and unprotected Caterpillars, who suffered a high number of casualties.⁹

JUNO Beach

The JUNO Beach landings were complicated by the worsening sea conditions. As the armor arrived much later than anticipated, many of the beach obstacles were underwater. The German defenses were relatively intact, as was the case on most of the invasion coastline, and therefore the Canadian infantry was left exposed to intense direct and indirect fire. However, as opposed to the bluffs and cliffs that backed OMAHA Beach, the terrain on JUNO favored the attacker. With no marked feature to defend from, the close-in German defenses soon fell from overwhelming numbers of assaulting infantry. The DD-tanks of A Squadron, 6th Canadian Armoured Regiment, which also came ashore under heavy mortar and shellfire, were to assist the infantry in pushing the Germans from the beach. The Sherman main guns assisted in eliminating two 75mm guns, one 50mm gun and six machine gun posts. Once these emplacements were quieted, many Germans would offer their surrender.¹⁰

Landings on JUNO were also made more difficult by the number of small villages that lined the invasion area. Courseulles, Bernieres-Sur-Mer, St. Aubin and Langrune would have to be cleared by the Canadian invaders. The Germans had also heavily mined this beach, with over 14,000 mines accounted for just on the eastern stretch of beach from La Riviere to St. Aubin. Once through the beach mines the assaulting armor had difficulty with the ten-foot high sea wall that abutted the villages, as the Germans had heavily blocked the beach exits.¹¹

These delays caused the beach to become more crowded, due to a combination of the follow-on assault waves and the rising tide. This congestion and confusion in the

confined intermingling of infantry and armor was described by Sergeant Frank

Weightman of 2 Troop, 80 Assault Squadron RE, as his unit landed in their AVREs:

The tide was early, high and choppy with the following wind. Only 60 yards of beach from the water's edge to the solid masonry at the foot of the sea wall, crowded with various ruined steel obstacles, reached through a mass of beached and washed up landing craft, stranded, wrecked or smashed. Captain [Sir Francis] Grant and [Troop Sergeant] Bill Reed preceded by two flails dropped off well and tried to blast an exit with Petard bombs. No success, they were impeded by the Canadian infantry who were taking cover.¹²

Determined AVRE crews like these were finally able to clear beach exits through a combination of obstacle-reducing petard fire, fascines, bobbins and bridges. Although a number of German strongpoints held out, particularly in St. Aubin, by 0900 hours four lanes were open, and by 1400 hours the entire Canadian division had landed and was moving inland.¹³

SWORD Beach

The intensity of the fire from the German defenses was very dependent upon where you were located on the beach. On GOLD and JUNO beaches there were sectors that were somewhat quiet in comparison with others. On SWORD Beach this was less the case, as the landings were complicated by not only the poor sea conditions, but by the large built-up areas that abutted much of the invasion beachhead--more a problem than on JUNO Beach--notably the city of Ouistreham on the eastern end of the objective area. On SWORD however, though the DD-tanks arrived just after the leading Crabs and AVREs, thirty-three of the thirty-four 13th/18th Royal Hussars tanks launched (from the regiment's "A" and "B" squadron) would make it to the shore to provide timely fire support.¹⁴

G. E. Masters, a DD-tank gunner with B Squadron, 13th/18th Royal Hussars, describes the landing on SWORD Beach:

All tanks engaged beach obstacles and strong points with their 75[millimeter] guns. Immediately behind us landed the Armoured Vehicles Royal Engineer (AVRE) and the other “Funnies” of 79th Armoured Division, with the flail tanks to the fore. My main feelings during the landing were of excitement not fear. It seemed just like all the other landings we had done in training; apart from the noise of the shellfire and when a nearby AVRE went up in flames we never knew what happened to it. We were not static for very long, as soon as the flails had cleared lanes from the beach, we moved into the road and advanced in support of our infantry--the East Yorkshire Regiment. We took our first objectives and by evening all objectives had been taken.¹⁵

What Masters describes is a plan that seems to be proceeding without great difficulty from the viewpoint of the soldier on the ground, even though it has been shown that the plan at SWORD Beach did not survive first contact and had its problems. One important point to take from his narrative is that this very complicated and dangerous assault seemed almost routine to some participants because of the thorough training and rehearsals that had been conducted. The division’s training was cited in a number of veterans’ accounts as playing a critical role in their success on 6 June.¹⁶

Clearing the beach exits on SWORD was made more difficult due to these built-up areas, as many of the seaside structures housed German soldiers and gun emplacements. The remaining specialized armor landing force of sixteen Crabs, twenty-four AVREs and eight armored bulldozers managed to clear five exits in the first hour of the assault, often within hand grenade range of the Germans.¹⁷

The outcome at the conclusion of D-Day operations was a positive one for the units of the 79th. The division as a whole had suffered 179 killed, wounded or missing, a large number, but less than the number of U.S. engineer casualties on UTAH Beach alone. Twenty-two of the division’s 120 AVREs were destroyed by the enemy, with

another twenty-two out of action until repairs could be made. Twelve of fifty Crabs had been destroyed, and a number of these were also in need of repair. Engineers had managed to employ eight fascines and ten SBG bridges, and with the flail tanks ensured thirteen of the eighteen planned lanes were open by day's end.¹⁸

These actions on the British beaches stood in stark contrast to that which was occurring to the west at OMAHA. Here, the few surviving tankdozers and bulldozers worked in the face of intense fire, attempting to assist the exposed Provisional Engineer Brigade soldiers in clearing lanes from the beach inland. Over 40 percent of engineers taking part in the initial assault at OMAHA would become casualties, and it was late in the day when enough beach exits had been secured to begin clearing the beach. As one of the leading American amphibious assault trainers of the time (and commander of the 6th ESB), Colonel Paul Thompson, noted,

During the preinvasion months endless thought and research had been devoted to developing ways of attacking the obstacles. An old axiom of war states that engineers cannot work under heavy fire; but that is exactly what these special engineers set out to do....in substance, the obstacle clearance plan on OMAHA Beach failed. The old axiom of war was confirmed: the special engineers could not operate effectively under that heavy enemy fire.¹⁹

Comparatively, the 79th had not faced the same dire challenges. However, the division had passed this first test of determined resistance coupled with numerous obstacles, and had met almost all of their objectives. As repair and refit began, so too would the beachhead continue to be swept and expanded by 79th soldiers and equipment in the coming days.

Post-Invasion

Hobart was finally able to get ashore on the evening of 8 June. With most of his staff still in England, the general quickly made the rounds of his units to assess morale,

and gauge how the operation had proceeded from the view of his soldiers. His immediate concern was that his subunits would be cared for and employed properly. Though his units were being adequately looked after, attacks on Bayeaux (7 June) and Bazenville (8 June) used AVREs to lead small-unit infantry assaults to clear these villages. Other supported infantry units were similarly using Crabs and AVREs to spearhead attacks. Hobart was less than pleased and noted that, “The infantry are apt to claim that its mere presence [an AVRE with a Petard] has a morale effect on the enemy and therefore exposes AVREs to fire which cannot be returned [due to the unfavorable maximum effective range of its weapons].”²⁰

Hobart would continue shuttling between his MAIN HQ in England and his TAC HQ on the continent for the next few weeks. During this time he ensured that the leadership at 21 Army Group--as well as major subordinate headquarters--understood that specialized armor was a valuable, non-renewable commodity and would not be misemployed from its established roles and functions. It was further agreed that 79th Division headquarters would be apprised of any subsequent plans for this equipment's use, and Hobart would name Brigadier Duncan, 30th Armoured Brigade commander, as his personal representative to ensure these agreements were followed.²¹

One operation that was deliberately planned in close cooperation with all headquarters was the 17 June attack on the Douvres la Deliverande radar station. The radar station was a German strongpoint containing five 50mm antitank guns, numerous light machine guns, twin Spandaus, and over 200 men. The station had held British attackers back for over a week. An operation led by 41 Royal Marine (RM) Commando was planned that would incorporate the AVREs of 26 Assault Squadron RE and Crabs of

B Squadron, 22 Dragoons in the assault, with two troops of AVREs from 77 Assault Squadron RE in a diversionary role. Planning and rehearsals were detailed, and artillery support (smoke and HE) was incorporated in all phases. The operation proved very successful, with only one AVRE destroyed and ten casualties. This would mark the first time that a deliberate operation had been cooperatively planned using specialized armor in support of a non-amphibious infantry assault.²²

This issue of how close is close support still had to be firmly established. The utility of AVREs, Crabs, Crocodiles and DD-tanks for post-invasion offensive operations was not yet fully understood and agreed upon by any of the British headquarters involved. This would become Hobart's main focus as he moved his Main HQ onto the continent later in July.

Invasion Lessons

Hobart, his subordinate commanders and staff made a number of visits to the division's units, as well as to supported formations, directly after the invasion. The focus on these units was to get firsthand accounts on the relative effectiveness of the new equipment in these first combat actions. The detailed findings were collated and summarized in a series of operational bulletins published by the 79th, and disseminated throughout 21 Army Group. Some of the key points and lessons that can be gleaned from this first tactical (opposed) use of specialized armor include:

1. Assault tactics worked well, and where the plan had to be adjusted due to the effects of weather and casualties, junior leader initiative, improvisation and flexibility ensured mission success.²³

2. Loading of LCTs by purpose-built teams worked very well. Crab and AVRE cooperation was noted as particularly effective, and it is apparent that intensive training and early integration paid off.²⁴

3. DD-tanks had mixed results due to weather, yet they were effective when they landed in numbers. The DD landing details were as follows: at UTAH Beach, 70th Tank Battalion landed twenty-nine of thirty tanks launched; on OMAHA Beach, 741st Tank Battalion landed only two of twenty-nine tanks launched, while the 743rd Tank Battalion shore landed all its tanks from LCTs; on GOLD Beach no tanks were launched, the 4th/7th Royal Dragoon Guards and Nottinghamshire Yeomanry shore landed all tanks; on JUNO Beach, the 6th Canadian Armoured Regiment landed twenty-one of twenty-nine tanks launched, while the 10th Canadian Armoured Regiment shore landed its tanks from LCTs; and one of the day's most successful launchings occurred at SWORD Beach, where 13th/18th Royal Hussars landed thirty-one of thirty-four tanks launched.²⁵

4. A DD-tank shroud defect with the main (top) rail was determined to have caused some of the floatation screens to collapse in the heavy sea. Once identified, this mechanical problem was rectified by the 79th Division REME and fitter shops upon their arrival to the continent.²⁶

5. Crabs worked very well, both in their minesweeping and direct fire roles. However, the Crab was not maneuverable enough to be employed in an infantry support role. It was recommended that the tank be used primarily in its assault mine-clearing role, and used against pillboxes and strongpoints only as an exception.²⁷

6. AVREs accomplished many of their assigned tasks, though they became favored targets of German gunners because of their distinct silhouette and therefore many

were destroyed. The AVRE SBG worked better than expected, but had to be replaced by fixed (i.e., Bailey) bridging as soon as possible. AVRE emplaced fascines worked well in reducing crater and ditch obstacles, but were not effective when employed to cross the sea walls. The 230mm petard mortar proved quite useful in reducing not only obstacles but German gun emplacements as well. The bobbin attachment worked well initially, but the material could not handle sustained, heavy traffic, was too short in length, and couldn't withstand tidal action (it would have to be replaced by steel matting from D+1 onward). In sum, the AVRE proved a flexible workhorse, yet Hobart still recommended a purpose-built engineer vehicle be designed and fielded.²⁸

7. The Bullshorn plow worked well at SWORD Beach in the vicinity of Lion-sur-Mer. Once inland the plow lost effectiveness due to the hardened soil. A recommendation was made to strengthen the plow to allow it to operate over more varied surfaces.²⁹

8. German minefields were not as formidable as intelligence suggested, though the beachside strongpoints and concrete obstacles were more difficult to overcome than had been anticipated. Some of the mines encountered were apparently more powerful, and had different types of fuzing, than had been known previously. Therefore it was recommended that trials be run immediately against these mines so as to make the necessary changes to the Crab and breaching procedures.³⁰

9. Armored bulldozers proved useful and effective, particularly as the tides ebbed and the beach obstacles became exposed. The Americans did not use armored bulldozers in large numbers, resulting in a high casualty rate for dozer operators. This is likely due to the high numbers of tankdozers used in the U.S. sector, which proved a better combat

vehicle suited to the obstacle clearance task (it was more survivable and had a gun). The 79th Division would still request tankdozers for future operations.

10. Finally, post-invasion maintenance presented a readiness issue. No spares were readily available for Crabs and AVREs, and the 79th's specialist workshops and maintenance personnel did not arrive in theater for some time. As maintenance priority was not given to specialized armor repair, mainly due to the thought that their important contribution was completed, many of the division's vehicles would be out of action for the first few weeks on the continent.³¹

Brigadier Duncan, commander of 30th Armored Brigade, echoed many of these observations and stated that the success of the specialized armor breaching teams and DD-tank crews was due to their flexibility and initiative. He would add further that, "The moral of this is that skill and a high standard of training will allow troops to overcome unforeseen difficulties and by determination and drive reach their objectives."³²

Lieutenant Colonel O'Neill, commander of Special Engineer Task Force (SETF) and thus nominally the engineer "over-all in charge" of the beach obstacle removal at OMAHA Beach, provided a number of insightful comments following the invasion. His thoughts were informed by both his first hand experiences on the beaches, particularly OMAHA on D-Day, as well as by a training visit he had made to the 79th Division at Orford on 9 April 1944 (after which he would begin conducting two months of assault training at the ATC in Woolacombe). He notes that the British Crab, Snake and Conger would be useful to incorporate into future mine clearance operations. He also wrote that the CIRD mine roller (Canadian) is better than the American rollers used at the time, and should be adopted. O'Neill's strongest comments were reserved for the tankdozer. He felt

the vehicle had more than proved its worth and should be modified for engineer use as a stopgap engineer tank, similar to the British AVRE. He concluded that continued development of a purpose-built engineer tank should be pursued. These comments were seconded by the commander of the 17th Armored Engineer Battalion, who forwarded them to the 2nd Armored Division commander for comment and action. Though this equipment would neither be adopted nor developed prior to the end of the war, this report, and memos like it, helped influence Bradley's decision to request from 21 Army Group specialized armor be incorporated into subsequent American operations.³³

The results of this first use of specialized armor formations can be fairly characterized as highly successful and critical to the timely accomplishment of the British day one objectives for OVERLORD. As General Eisenhower would later note as reflected on the operation:

Apart from the factor of tactical surprise, the comparatively light casualties which we have sustained on all beaches except OMAHA were in large measure due to the success of the novel mechanical contrivances which we employed and the staggering moral and material effect of the mass of armor landed in the leading waves of the assault. The use of large numbers of amphibious tanks to afford fire support in the initial stages of the operation had been an essential feature of our plans, and, despite the losses they suffered on account of the heavy seas, on the beaches where they were used they proved conspicuously effective. It is doubtful if the assault forces could have firmly established themselves without the assistance of these weapons. Other valuable novelties included the British AVRE and the "flail" tank which did excellent work in clearing paths through the minefields at the beach exits.³⁴

Eisenhower noted that the DD-tanks were an "essential" element to the success of OVERLORD, and that the "funnies" more than proved their worth where employed.

As important as this recognition was, more important was Hobart's realization that the fight had just begun. His efforts directly following the invasion reflected his foresight and drive to maintain relevancy for the division on the Allied drive to Germany.

The division would immediately resume training when all its units arrived in France, joining the OVERLORD participants who were still being rounded up from supported maneuver units. Unit consolidation within the 79th proved difficult as the infantry and armor commanders had grown to very much like their attachments, and were not willing to let go of them easily. A few calls from Hobart sped the detachment process. Once consolidated, the training would be more tailored to account for the early lessons learned and adjusted for the missions that the unit's leaders expected to be called upon to perform. The equipment went through an intense maintenance and refit period when not in use, and a number of modifications were made on Crabs, AVREs and Crocodiles to correct deficiencies noted in the first weeks of combat. Innovation would not wait for an operational pause, and the division trained and perfected new techniques in anticipation of new missions. Though the division's success had far exceeded the planners' dreams, thus sealing the legacy of Hobart and the division, a challenge still lay ahead. How would the division perform in unforeseen, unscripted circumstances on the sweep into Europe?³⁵

¹Delaforce, 62.

²Agreed upon at a 12 January 1944 meeting. See Macksey, *Armoured Crusader*, 273.

³*The Story of the 79th Division*, 17.

⁴David Howarth, *D-Day*, 163. For a detailed plan of LCT loading see the *79th Armoured Division Final Report*, App. E.

⁵Warren Tute, John Costello and Terry Hughes, *D-Day*, rev. ed. (London: Pan Books Ltd, 1975), 209.

⁶Kershaw, 151; Delaforce, 104.

⁷Howarth, 172-9; Icks, 215.

- ⁸Howarth, 176; Fletcher, *Vanguard*, 41.
- ⁹Derek Boyd, *Royal Engineers*, from the *Famous Regiments* series, ed. Lt-General Sir Brian Horrocks (London: Leo Cooper Limited, 1975), 123.
- ¹⁰Perrett, 114; 79th Armd Div Operational Bulletin No. 3, 79AD.1/19.G, 31 Jul 44, Liddell Hart Archives file LH 15/11/13, KCL, 1.
- ¹¹Costello and Hughes, *D-Day*, 205.
- ¹²As cited in Delaforce, 101.
- ¹³Kershaw, 148; Delaforce, 101-3.
- ¹⁴Howarth, 231; 79th Armd Div Operational Bulletin No. 1, 79AD.1/19.G, 19 Jun 44, Liddell Hart Archives file LH 15/11/13, KCL, 14. The number of successful tank landings is in contravention with that provided by the 13th/18th official history. The history states that the 34 tanks successfully launched, only 31 landed, with three foundering short of the beach. See Major-General Charles H. Miller's *History of the 13th/18th Royal Hussars (Queen Mary's Own): 1922-1947*.
- ¹⁵Forty, 146-7.
- ¹⁶For similar first-hand accounts for which space does not allow here see: Duncan, Fletcher, Forty, Howarth, Kershaw and Perrett.
- ¹⁷Howarth, 233.
- ¹⁸Delaforce, 111; Duncan, 25; *Story of the 79th*, 54. There are numerous accounts of the D-Day struggle on OMAHA Beach. For an engineer perspective see Alfred M. Beck, Abe Bortz, Charles W. Lynch, Lida Mayo and Ralph F. Weld, *U.S. Army in World War II: The Technical Services: The Corps of Engineers: The War Against Germany* (Washington, DC: Center of Military History, 1985), Chapter XV.
- ¹⁹Paul W. Thompson, "D-Day on OMAHA Beach," *Infantry Journal*, June 1945, 44.
- ²⁰Delaforce, 113-4.
- ²¹Macksey, *Armoured Crusader*, 292-4; *Story of the 79th*, 57.
- ²²79th Armd Div Operational Bulletin No. 2, 79AD.1/19.G, 23 Jun 44, Liddell Hart Archives file LH 15/11/13, King's College, London, 9-11; *Story of the 79th*, 65.
- ²³79th Armd Div Operational Bulletin No. 1, 1.

- ²⁴79th Armd Div Operational Bulletin No. 1, 1.
- ²⁵Perrett, 113-4.
- ²⁶79th Operational Bulletin No. 3, 1-2; 79th Armd Div Operational Bulletin No. 1, 3.
- ²⁷79th Armd Div Operational Bulletin No. 1, 5.
- ²⁸79th Armd Div Operational Bulletin No. 2, 6-7
- ²⁹79th Armd Div Operational Bulletin No. 1, 10-11.
- ³⁰79th Armd Div Operational Bulletin No. 2, 4; 79th Armd Div Operational Bulletin No. 3, 2; 79th Armd Div Operational Bulletin No. 1, 2.
- ³¹*79th Armoured Division Final Report*, Appendix C.
- ³²Duncan, 22.
- ³³*After Action Report, The Provisional Engineer Group, 3 Jun – 6 Jul 1944*, AGF Report # 4003, WWII AGF Pt II (Microfiche), CARL; Gawne, 129-138; Lewis, 197. Lieutenant Colonel O'Neill commanded the Provisional Engineer Group for Special Assault Demolition (later the SETF) at OMAHA, a last minute organizational change due to the inability of U.S. Army and Navy engineers to effectively coordinate a beach clearance demarcation line. His organization would include engineers from both services, and would be charged with the mission to conduct the assault obstacle clearance from low to high water marks (in addition to a great deal more). Lieutenant Colonel O'Neill was a very experienced commander, having left command of the 112th Engineer Combat Battalion when selected by Eisenhower to visit the Fort Pierce and Woolacombe ATCs, and the 79th Division training site, to determine best practice for his newly formed unit. Due to the unit's last minute creation, O'Neill was not able to incorporate mechanical breaching and clearance means to the extent he had wished possible. He was able to make maximum use of the limited tankdozers available to him.
- ³⁴Dwight D. Eisenhower, *Report by the Supreme Commander to the Combined Chiefs of Staff on the Operations in Europe of the Allied Expeditionary Force, 6 June 1944 to 8 May 1945* (Washington, DC: U.S. Government Printing Office, 1946), 24.
- ³⁵Duncan, 26-27, Perrett, 116.

CHAPTER 4

BREAKOUT

Our Army, unfortunately, did not lead the way in armoured warfare during World War II--except at a late stage, and then mainly in the sphere of the 79th Armoured Division.¹

B. H. Liddell Hart

The use of specialized armor following the breakout from Normandy would reflect the divergent nature of British generals' theories as to the use of armor in the offense. Hobart, as befitting his relationships with Fuller and Liddell Hart, believed his division's capabilities were best suited to support decisive operations of penetration and exploitation. Montgomery, however, reflected the more conservative mentality of using the armor to support well-planned, highly synchronized and coordinated attacks. This divergence of opinion ensured that the 79th would stay busy regardless of the nature of combat, whether they were the siege-type operations of Caen and Le Havre, or the more maneuverist operations later at Antwerp (Walcheren Island) and the Rhine River crossings.

Indeed, as Montgomery would later note in a speech to the Royal United Service Institute:

As the campaign progressed, the need for special armoured vehicles became increasingly apparent. Against fixed defenses such as existed around the ports, mine-sweeping tanks, flame-throwers and engineer tanks were invaluable. The D Day technique for the early landing and quick build up of armour was also applied at the crossings of the Rhine and the Elbe. This was made possible by the use of amphibious tanks and amphibious assault craft carrying infantry, light vehicles and supporting weapons.²

There was be no question that the need for specialized armor to provide timely support would remain constant as the Allied armored divisions and mechanized infantry spearhead rolled across France and into Germany.

Bocage to Breakout

One of the first challenges faced by the Allies, once a beachhead was established, was that of terrain, specifically the hedgerow, or Bocage, country. A great deal of planning time and focus had been devoted to the landings and initial assault. Although Allied planners and commanders knew of this hedgerow terrain, it was not deemed a significant issue that would impede a breakout from the invasion beaches. However, advancing Allied forces would quickly realize that the Bocage country severely limited their movement, and greatly aided German defenders.³

The American and British forces would employ similar trial and error approaches in dealing with the German hedgerow defenses. The British had a much easier task facing them for two reasons, one, they had less hedgerow country in their area of operations (AO), and two, they had units that were equipped to deal with the problem. The 79th tactical headquarters would recognize the challenge the terrain presented, and after a couple of weeks' action it was decided that AVREs were suited to the task of breaching the hedgerows with their petard mortars. Crocodiles were then added to these specialist breaching teams, and the combination of high explosive and flame proved successful in penetrating Bocage defenses.⁴

The U.S. ground forces found the going in their AO more difficult, due in large part to the great expanse of hedgerow country they faced. Also, the Americans were limited by the equipment that could be applied to the problem. Tankdozers were found to

work in close coordination with assaulting infantry, but these specialist tanks were too few in number. An innovative solution that gained renown, with subsequent wide acceptance throughout the army, was the adoption of modified Sherman tanks (Culin hedgerow-cutters) as “Bocage busters.” This bottom-up innovation, coupled with close infantry-armor coordination, helped the U.S. Army finally achieve success in breaking out from the hedgerows. This development demonstrates that army leaders were not averse to employing armor in unique ways, but does highlight the advantage the British held in centrally controlled specialized armor that could quickly respond to a variety of tactical challenges.⁵

Le Havre and the Channel Ports

Once a breakout had been achieved, assault teams from the 79th would support every attack to clear the channel ports. In each attack the assault techniques practiced in England and demonstrated at Normandy would again prove effective. Crabs and AVREs reduced minefields, performed assault obstacle crossing with fascines and bridges, and destroyed concrete emplacements. Crocodiles were added into the assault for the first time on a wide basis, and their flame proved very effective in reducing German willingness to resist from strongpoints and pillboxes.⁶

The 79th would be used extensively by the British 1st Corps, in support of the push on Le Havre, from 10-12 September 1944. Brigadier Duncan was placed in command of the division’s assault force which included two Crab regiments, a regiment of AVREs, two squadrons of Crocodiles and some of the newly outfitted Kangaroo units. The Kangaroo was a combat development, or adaptation, that the division had inherited during this time. It was an armored personnel carrier (APC) that was in essence a stripped

down M7 Priest Howitzer. The idea has been credited to the Canadian II Corps commander, Lieutenant General Guy Simonds. His thought was that these open topped tracked vehicles would allow the soldiers in infantry divisions better mobility, and thus be better able to keep pace with the armored divisions as they raced forward. The idea caught on throughout 21 Army Group and both Sherman and Ram (Canadian) tanks were converted to this role. As the number of converted vehicles grew, two APC regiments were formed (the 49th RTR and the 1st Canadian APC Regt), and were subsequently attached to the 79th Division's 31st Tank Brigade.⁷

In support of the attack on Le Havre, Crabs and AVREs would lead an armored assault following air and artillery preparation. Once lanes were opened through the obstacle belts Crocodiles moved through, firing flame into German strongpoints. The Kangaroos followed closely behind, bringing up infantry in support, primarily to deter German employment of their effective anti-tank weapons, notably the *Panzerfaust*. With the exception of mounting the infantry in the Kangaroos, the assault tactics used were the same as had been developed earlier.⁸

The action at Le Havre is important in that it marked the first time the division's assault technique was employed on such a large scale (see Appendix D for a diagram of the assault technique). However, Crabs were only moderately successful in clearing lanes, due to both the large number of mines and the determined German defense. To assist Crabs a number of Snakes (mine-clearing line charges) were successfully employed by supporting AVRE crews. The close cooperation of AVRE, Crab and Crocodile crews was deemed critical to the success of the two assaulting divisions (49th/51st) in quickly

clearing the town of German resistance. Due in great part to these effective armored assault tactics, Le Havre fell in less than three days, with a loss of only fifty British dead.⁹

On 17 September of the following week, the 3rd Canadian Division would attack into Boulogne employing a similar mix of specialized armor, only this time the infantry would lead to clear the outer perimeter defenses. Once this initial anti-tank threat was cleared, three armored columns, each led by 79th tanks--and commanded by one of the division's lieutenant colonels--would attack into the city on separate attack axes. Brigadier G.S. Knight, the 31st Armored Brigade commander, was placed in charge of divisional units for the assault. The plan called for bombers to create breaches in the outer defenses, followed by the infantry-laden Kangaroos securing these penetration points. Bulldozers would be brought up to fill in craters on the routes as necessary. The three assault teams, each consisting of one troop of Crabs, two troops of Crocodiles, and a half troop of AVREs, would then be called forward to assault through the gaps.¹⁰

Casualties were much greater during this fight, as German resistance was fierce and tanks struggled in the restricted confines of the city. After four days the city finally fell to the Allies, due in great part to infantry-armor cooperation, and also because of the effective use of Crocodiles in an urban assault. The assault team technique was again shown to work, with AVRE-Crocodile cooperation further refined. What was less effective, and subsequently discarded from practice, was the use of bombers to breach obstacles. The HE bombs created more problems than they solved, with the assault almost foundering due to the poor going on the cratered and rubble roads.¹¹

At the same time as the attack on Boulogne, U.S. forces were conducting operations at Brest. It should be mentioned at this point that U.S. forces in the European

theater had been trying to acquire flame tanks for months. British Crocodile tanks had been viewed as a potentially valuable addition to the U.S. armored inventory for use in the European theater, as early as February 1944. This belief was reinforced by positive reports received on armored flamethrower action in the Pacific. The American request for Crocodiles could not be met prior to OVERLORD due to the short supply of Sherman platforms (a conversion kit was in the works), and the inability of British manufacturing to produce enough Churchill Crocodiles to meet both British and U.S. Army requirements.¹²

The 12th Army Group had still not received the promised Sherman Crocodiles by the fall of 1944, due to production delays in the U.K. With offensive operations steadily increasing the perceived demand for the armored flamethrower, the Ninth Army commanding general, Lieutenant General William H. Simpson, pressed the issue with Eisenhower. Simpson wrote that, “Recent operations against fortified areas and towns have demonstrated the value of flame throwing tanks in reducing strong points, pillboxes, and other types of defensive works.” He specifically wanted the flamethrowers for the upcoming assault on Brest. His plea for flame support was forwarded to and met by 21 Army Group. When Montgomery’s headquarters detached a squadron of RTR Crocodiles to support Ninth Army’s offensive operations it marked the first time an American general asked for, and received, a specialized subunit of the 79th.¹³

B Squadron, 141 RAC was the unit selected to provide Crocodile support to the U.S. forces. The key task for the squadron would be in supporting the assault into the strongpoint on the west end of town, Fort Montbary. Indeed, the plan developed by the VIII Corps engineer hinged on the success of the Crocodiles to provide close-in flame

support. The action served as an excellent example of the success of combined arms operations with the demonstrated close cooperation of armor, infantry, engineers and artillery (with mortars providing smoke obscuration). This marked the first occasion that 79th units would fight in direct support of American units, and both the Ninth U.S. Army commander (Simpson) and the 29th U.S. Infantry Division commander (W.E. Sands), praised the unit and recommended further cooperation. British specialized armor had more than proven its worth in the eyes of U.S. Army leaders and soldiers.¹⁴

The last major actions the division would participate in at this time were at Calais and Cap Gris Nez, two coastal strongholds that contained hardened artillery positions which ranged the English Channel, and therefore had to be taken to open the channel to unhindered east-west traffic. 31st Armoured Brigade, under Knight, would again command the division's subunits, still in support of 3rd Canadian Division. To assist the Canadians on their coastal assaults, the 79th would employ five squadrons of Crabs, two squadrons of Crocodiles, and two engineer assault squadrons, equipped with AVREs. Most of these units were the same as those employed on operations at Boulogne.¹⁵

These coastal gun positions proved very difficult to defeat. Each position was well defended, employing a mix of wire, mine and tank ditch obstacles along its perimeter. The pillboxes and gun casements were composed of the same thick reinforced concrete that the Allies faced on Normandy beaches. The positions easily withstood most artillery, tank, and machinegun fire. It was only when artillery smoke, tank and AVRE main gunfire, Crocodile flame, and close-in infantry support were combined that these positions would each, in turn, fall to the attackers. Again, small unit actions increased the confidence and proficiency of the specialized armor crews as they worked closely with

their infantry counterparts. Lessons were noted after each engagement as to the “do’s and don’ts” and disseminated throughout the division. As a result, each subsequent assault proved more successful in terms of increased speed and reduced friendly casualties, and in less than a week (25-30 September), all of the German defenders were defeated, with the Channel free from the enemy’s punishing indirect fire.¹⁶

Battle for Antwerp (the Scheldt, Beveland and Walcheren Island)

The next big operation for the division would be in support of 21 Army Group’s attempt to clear the Scheldt Estuary and thus open the sea lane to Antwerp. This was a highly complicated operation, requiring a series of amphibious assaults. The island of Walcheren had to be seized to open the Scheldt, as the island sat astride the opening to the port channel. The division’s role in the operation would be two-fold. Once again DD-tanks, Crabs, AVREs and armored bulldozers would lead the assault to penetrate enemy defenses and clear lanes inland. This time, the division would have a new and equally important role, transporting assault troops onto the beaches and through the cleared lanes.

The 79th would perform this transport mission by employing its newest vehicles, Buffaloes. Buffalo was a generic term given to a family of amphibians also known as LVTs (Landing Vehicles Tracked). These vehicles were of American origin, having been used extensively by the U.S. Marines on assaults in the Pacific theater. These vehicles could carry a fully-laden platoon, small vehicles (jeeps), or a similar amount of supplies. In September 1944, the 11th RTR found themselves turning in their CDL tanks to be outfitted with Buffaloes, at the same time coming under the division’s command. Other divisional engineer units would swap their AVREs for Buffaloes in early fall, further

increasing the amphibian fleet. In a few short weeks these units were equipped and trained on the employment of Buffaloes.¹⁷

By early October, small-scale amphibious assaults began in the estuary, as British units began clearing the channel's southern coastline. These operations primarily involved the 11th RTR Buffaloes and DD-tanks from the Staffordshire Yeomanry. 79th support to the 3rd Canadian Division amphibious assaults was very successful even though it marked the first large-scale use of Buffaloes by the British. The assaulting infantry were able to quickly and effectively establish a beachhead, with Buffaloes carrying 880 loads (two infantry brigades and over 600 vehicles and guns), with only twenty-six casualties and three Buffaloes destroyed.¹⁸

On 26 October, a second, much larger, amphibious assault across the estuary was conducted. The assaulting troops would come from the 52nd (Lowland) Division, and the 79th would provide both amphibians and DD-tanks. On this attack 79th subunits ferried over 700 loads across the Scheldt, again carrying a mix of men and materiel. DD-tanks, however, would only achieve limited success due to muddy exit banks and high dike walls. As a result, the Shermans had difficulty providing timely direct-fire support to the infantry. However, these attacks were ultimately successful in setting the conditions for a final amphibious assault to clear the German positions at Walcheren Island.¹⁹

On 1 November, the division supported a full-scale assault of Walcheren Island led by 4 Commando Brigade. The attack was complicated due to a mix of natural and manmade obstacles. The Germans had reinforced existing dikes and moats with wire and mines, usually overwatched by concrete gun emplacements and pillboxes. Poor trafficability due to muddy beach conditions was made worse through the liberal use of

beach obstacles and mines. In the vicinity of Flushing, on the southern tip of the island, the Germans constructed obstacles and reinforced gun positions around an existing twenty-foot sea wall. These defenses were comparable to those the British faced at Normandy, but now the attackers did not have the luxury of time to conduct detailed planning and rehearsals.²⁰

The assault was made even more treacherous by German artillery positions that ringed the island. These positions were neither reduced nor suppressed (naval and aerial bombardment was only marginally successful), and thus the guns were able to bring effective 3-inch shellfire to bear on many of the assaulting LCTs. Two of the division's assault team LCTs were forced to turn back due to damage sustained from these gun positions. Once landed, the assaulting armor faced another challenge, soft clay. Many vehicles were quickly stuck on the beach, and crews that successfully landed found themselves trying to recover mired vehicles, instead of supporting the assaulting infantry. By the end of the day less than half of the vehicles that had managed to make it to the island would assault inland. LCVs were not impacted by the poor trafficability and were able to quickly move inland carrying assaulting troops and equipment.²¹

The Germans would fight from their prepared shore defenses for almost 72 hours, resulting in a number of British troop and equipment casualties. It would take over a week to finally clear the island, due in part to the widespread flooding caused from bombed-out dikes. Buffaloes proved useful in moving troops over the flooded terrain, but they would be the division's only success story. The poor trafficability on the beaches and inland would reduce the effectiveness of armor and bulldozers, most of which never left the muddy beaches. Lessons from this battle were recorded by Hobart and his staff as

they immediately began looking at methods to mitigate similar troubles on future operations.²²

Hobart alludes to the urgency and challenges faced by the division in the run-up to the Scheldt campaign in a letter dated 3 October when he wrote, “Am getting some new units and things: and hectically engaged in complicated movements and inspections, and the inevitable race against time. NOT in the case of my old units: they are all right.” His concern lay in integrating new troops and equipment while in the middle of a campaign. These soldiers had not benefited from the intensive training and rehearsals conducted back in Britain, and much of this new equipment was as-yet untested in the European theater. As such, Hobart gave Brigadier Duncan the mission to establish training and instructional wings that would help ensure the division could effectively and efficiently incorporate these new capabilities on future operations.²³

The Training Wings

The division continued its focus on training and development of new equipment and techniques through its establishment of specialist wings. These wings were a natural progression from the training and development wings previously established in Britain, and were often created in response to an urgent requirement noted by maneuver units as they continued the attack toward Germany.

F Wing, the first training wing established on the continent, was formed at Hobart’s request at Gheel, Belgium on 12 December 1944. Its first mission was to investigate methods to counter the new and growing antipersonnel (Schu) mine threat. Numerous trials were run to determine the best way to defeat these mines, many of which were of wood construction and therefore undetectable by standard means. A variety of

options were tested and considered including mine rollers (the CIRD was retested), new plows and rakes, and even burning mines with Crocodiles. Ultimately an armored vehicle solution was decided on with the name Centipede. This was a frame consisting of multiple rollers that could be pulled behind a small tracked vehicle, such as a Weasel. Second Army would employ this new capability sporadically throughout the remainder of the war. Perhaps more important, the wing also tested new smoke generators, an improved ARK, new SBG bridges and carpet-laying devices for AVREs, and a British version of a tankdozer. This tankdozer, a turretless Centaur model tank, would eventually enter production back in the U.K. and be used on operations in Germany following the Rhine crossing. The training wing concept had been successfully reestablished, and Hobart ensured its utility would be applied to other problems.²⁴

G Wing was the next opened, on 15 January 1945, on the River Maas, near Maastricht. This wing was charged with working closely with the 12 Corps staff to find the best possible method for a deliberate river crossing of the Rhine. This divisional wing would again conduct equipment experimentation and capability determination, coupled with development of suitable river crossing techniques. The wing would grow very large by the end of the month, when newly converted DD-tank and Crocodile regiments arrived to begin training on their new roles (these units included the 7 RTR, 11 RTR, 44 RTR and the Staffordshire Yeomanry). It was during this time that the division would grow to be the largest in the British Army, with five full brigades, seventeen regiments, over 21,000 soldiers and 1500 AFVs. In part because the division had grown so large, it could afford to heavily invest so many units in the training wing concept.²⁵

The division's engineers were charged with operating H Wing, established at Nijmegen on 12 February. This wing's purpose was to establish the best method for conducting heavy rafting operations on the Rhine, and then run each of the engineer assault squadrons through the training. Six squadrons would complete their training by March 1945, each proficient in conducting class 50/60 rafting operations, and would prove critical to the success of the impending river crossing.²⁶

The final training wing established was J, on 4 March, primarily tasked to establish navigational methods for Buffaloes and DD-tanks during limited visibility operations. This was a problem that had been noted during both the Normandy and Scheldt operations, and because of the width of the Rhine the issue could not again be discounted. A variety of navigation methods were experimented with including different types of compasses, beacons and radio direction finding aids. A radio solution was decided upon, with the necessary equipment procured, vehicles outfitted, and leaders trained on its use, all in the three weeks prior to the crossing.²⁷

It is interesting that activity at these training wings remained heavy throughout operations in the Reichswald and Rhineland (VERITABLE and GRENADE respectively). Hobart firmly believed that techniques had to be decided upon, briefed and rehearsed prior to actual conduct against an armed opponent, something that did not happen prior to the Scheldt campaign. Hobart was not willing to allow experimentation to overstep the bounds of mission effectiveness, safety and common sense, and he personally managed the operational risk in this regard with the full support of Field Marshal Montgomery. The wings served the varied roles of experimentation test bed, training developer, and as a troop/unit trainer. Indeed, units were training at most of these

wings just days prior to the actual crossing of the Rhine. This approach would not have been successful had Hobart not been allowed to maintain strong, centralized control of his units.²⁸

By 21 March, the wings had successfully accomplished their missions with the staffs and equipment returning to their parent units within the division. One key to the success of these training wings was the work accomplished by the REME workshops. These soldiers worked continuously throughout the period making the necessary repairs and modifications to numerous vehicles and equipment, particularly DD-tanks, as well as recovering stranded (and sunken) craft used at the various training sites.²⁹

Operation PLUNDER (Rhine River Crossing Operations)

By March 1945, Allied forces were staged all along the west bank of the Rhine, prepared for one last, deep thrust into the heart of Germany. The Rhine River crossings, code-named PLUNDER by the British, were deliberately planned, rehearsed and executed, second only in scale to the Normandy landings. Through its training wings the 79th made intense efforts to train and rehearse Buffalo and DD-tank crews, in concert with the units to be supported. Maintenance of equipment was equally a concern, as many of the Sherman DDs had to be refitted with floatation gear that had long ago been discarded, or had fallen into disrepair. SHAEF message traffic from the period indicates that DD-tank maintenance status was also a concern for the U.S. command. Messages relayed between the War Department and the Army Group commanders (through Eisenhower) suggest a serious lack of visibility on not only DD-tank maintenance status, but questions how many of these tanks were still out in the field. It was also noted that

repair parts and spares were lacking, and that Americans would have to rely on British holdings to get most of the U.S. DD-tank fleet operational.³⁰

These tanks were critical to both forces, especially for the British as their plan was similar to D-Day in that DD-tanks would lead the assault forces. Instead of Crabs and AVREs, Buffaloes would be the key piece of specialized armor provided by the division, as they would ferry waves of assaulting infantry to the far bank. On the night of 23 March, units marshaled and loaded Buffaloes as the assault across the river commenced.³¹

As the assault unfolded, DD-tanks succeeded in crossing in great numbers, though some became bogged down on the muddy eastern embankments. The tank crews were able to accomplish their mission and provide direct fire support to the follow-on infantry force. It was during the night crossing that another “funny” would finally be employed, the CDL tank. The plan called for a CDL-equipped squadron to light the far bank during night operations on 24 and 25 March. The powerful lights would not only assist units as they ferried across the wide river, they would also deter mine and sabotage swimmer threats along the upstream (north) approach. These tanks became favorite targets of German gunners, although only one tank would be lost in action. In the end the CDL squadron successfully accomplished its unique mission, and could finally claim they had contributed to the division’s legacy.³²

From 24-26 March the four Buffalo-equipped regiments tasked with ferrying infantry made over 3800 trips, carrying most of the fighting soldiers of the Highland, 3rd Canadian, 43rd and 15th (Scottish) Divisions across the Rhine. This was accomplished with only thirty-eight casualties and nine destroyed Buffaloes. On 26 March, Prime

Minister Churchill and Field Marshal Alan Brooke accompanied Field Marshal Montgomery and General Hobart across the Rhine in a Buffalo (see photo at Appendix A). Churchill addressed the men assembled, congratulating the Buffalo crews on a “splendid job of work.” It had been a monumental task, flawlessly executed.³³

The assault across the Rhine was the largest operation the 79th would conduct following OVERLORD, and certainly the most important too. The instructional wing concept had shown itself worthy of the investment of time, men and materiel. DD-tanks had once again proven their value in an amphibious assault, with much credit due the REME units for getting the tanks back into a mission capable status. The concept for the use of Buffaloes was also found to be sound, and the engineer squadrons that manned them deemed as capable at their employment as they had been the AVRE. Finally, CDL tanks had even provided a significant, although limited, contribution.³⁴

The 79th Division’s success during OVERLORD and on these subsequent operations through late 1944 and early 1945 would pique interest elsewhere. AVREs, ARKs and Crocodiles were all used in the Italian campaign beginning around August 1944. Use of ARKs and AVREs would steadily increase as they were found to be effective in supporting the numerous stream and gap crossings being conducted. An armored engineer brigade was organized in theater, consisting of two AVRE regiments, a Crocodile regiment, and a Crab regiment³⁵

The U.S. Army also attempted to establish specialist armor units in northwest Europe. Three such specialist battalions were organized, the intent being an allocation of one battalion per Army. The units’ primary mission was to conduct mine and obstacle clearance, and to provide support to Corps and Divisions on request through the

numbered Army staffs. Each battalion was to be outfitted with five tankdozers, eight rolling mine exploders (U.S. variants of the CIRD), three Crabs, and an undetermined number of Snakes. The mine exploders were never favorably received due to maneuverability limitations and a demonstrated inefficiency at the core task, exploding mines. These units saw limited action and were therefore not effective.³⁶

A key reason for continued British success in employing specialized armor, and a reason why the Americans continued to struggle, was that a purpose-built unit had maintained the strong thread of training and development begun well prior to the campaign's commencement. From the beginning British leaders had agreed that the division was a required investment to help ensure success. The U.S. Army followed a much less structured, decentralized approach in its efforts, and as such often struggled to meet the needs of units through rapid, well synchronized combat developments.

The U.S. Army also lacked a leader, or leaders, that possessed the necessary experience, attitude and vision to shepherd these innovations. The strong-willed, yet highly capable Hobart was such an individual, and he built a cadre of like-minded officers that would be equally critical factors in the division's success. As Montgomery noted in a post-war lecture, Hobart and his "competent advisors" enabled the success of this huge task in that, "It was found that centralization under him was essential in order to achieve flexibility and provide a controlled programme of workshops overhaul, rest and relief."³⁷ The strong influence of the 79th Division in the development and use of specialized armor had proven itself worthy of the investment.

¹Macksey, *Tank Pioneers*, 203.

²Field Marshall Sir Bernard L. Montgomery, lecture entitled “21st British Army Group in the Campaign in North- West Europe, 1944-45,” *The Journal of the Royal United Service Institution* 90, no. 560 (November 1945): 447.

³One Allied leader who did not look forward to fighting through the Bocage country was Field Marshal Alan Brooke, who voiced his opposition on a number of occasions. See Carlo D’Este, *Decision in Normandy*; and Gordon A. Harrison, *Cross Channel Attack*. Also refer to Michael D. Doubler, *Busting the Bocage: American Combined Arms Operations in France, 6 June-31 July 1944* (Fort Leavenworth, KS: US Army Command and General Staff College, 1988).

⁴*Story of the 79th*, 71-75.

⁵The most thorough discussion of the U.S. attempt to defeat the Normandy Bocage is presented in Doubler’s, *Busting the Bocage*.

⁶Duncan, 30.

⁷Perrett, 118.

⁸Macksey, *Crusader*, 304-5.

⁹*Story of the 79th*, 93-109.

¹⁰*Ibid.*, 115-127.

¹¹Macksey, 306-7; Perrett, 119; *Story of the 79th*, 115-127.

¹²SHAEF Message traffic, SHAEF, SGS Records, Roll 42, #470.71 (Flamethrowers), 665-684.

¹³SHAEF Message traffic, SHAEF, SGS Records, Roll 42, #470.8 (Tanks), 4 November 1944; Macksey, *Armoured Crusader*, 304.

¹⁴*Story of the 79th*, 127-133; Fletcher, 49; Alfred M. Beck (et al.), *The Corps of Engineers: The War Against Germany* (Washington, DC: U.S. Army Center of Military History, 1985), 384.

¹⁵Perrett, 120.

¹⁶*Story of the 79th*, 133-140.

¹⁷Forty, 154-5; Fletcher, *Vanguard*, 51.

¹⁸J. L. Moulton, *Battle for Antwerp: The Liberation of the City and the Opening of the Scheldt, 1944* (London: Ian Allan Limited, 1978), 91-3; Fletcher, *Vanguard*, 53; Perrett, 120-22.

¹⁹Moulton, 105-9.

²⁰*Ibid.*, 134-5.

²¹*Ibid.*, 161-3.

²²Fletcher, *Vanguard*, 53; Moulton, 165-6. In a 12 November 1944 letter to the British 8 Corps commander, Lieutenant-General Richard O'Connor, Hobart addresses a number of these post-Walcheren lessons. He stresses two key issues, one, that reconnaissance and crossing site selection be conducted by trained (i.e., 79th) personnel, and two, that LVTs (Buffaloes) and DD-tanks rely on stable exit bank conditions--not found on the island's dykes (LH 26/02/03).

²³Macksey, *Armoured Crusader*, 309.

²⁴Duncan, 41-3; Macksey, *Armoured Crusader*, 311-14; Fletcher, 56-59; *Story of the 79th*, 223; trial details are also contained in the 79th Division's *Final Report*.

²⁵Duncan, 42; Macksey, *Armoured Crusader*, 311-14; *Story of the 79th*, 225.

²⁶Duncan, 43; *Story of the 79th*, 227.

²⁷Fletcher, 60; *Story of the 79th*, 227-9.

²⁸Mackey, *Armoured Crusader*, 313-5.

²⁹*Story of the 79th*, 229.

³⁰SHAEF message traffic dated 14-16 Dec 44, SGS SHAEF File #470.8.

³¹*Story of the 79th*, 231.

³²*Ibid.*, 237.

³³*Story of the 79th*, 243; Duncan, 43-45.

³⁴*Story of the 79th*, 247.

³⁵R. L. France, "Arks in Italy," *The Royal Engineers Journal* 62 (June 1948), 115-119; T. Q. Donaldson, *Army Ground Forces Observers Board—MTO, Report #509* ("Armored Section, Fifth Army"), 23 June 1945. The brigade would find itself continually employed in support of virtually all the divisions involved in the campaign. This brigade provided LNOs to Fifth Army to advise on the use of the British armor, an

arrangement modeled very much on earlier 79th Division experiences. This arrangement would lead to a pooled use of assets, with ten Crabs provided to Fifth Army for the spring offensive. LNOs would also provide input to Fifth Army staff on an armored information memorandum (No. 1) that would provide maneuver commanders with an overview of the characteristics and capabilities of Crabs, Crocodiles and tankdozers.

³⁶Donaldson; United States Army Corps of Engineers, *Final Report of the Chief Engineer, European Theater of Operations: 1942-1945* (Paris: Herve et fils, 1945), 164; *HQ ETO Immediate Report No. 24 (Combat Observations)*, 6 Jan 45, AGF Report File #5699. The popularity of the British equipment would lead to a Provisional Armored Engineer Assault Company to be raised in support of 1st Armored Division in Italy. The company would employ ten Shermans converted to ARKs, seventeen converted to carry fascines and/or personnel, and four tankdozers. They would achieve mixed results during the duration of the Po campaign. The U.S. Army achieved much better results from their use of specialized armor during the amphibious assault landings in southern France (Operation ANVIL). Lieutenant General Jacob Devers and Major General Alexander Patch were both strong proponents of integrating armor into the van of these assaults, and oversaw the successful integration of “tank-gapping” teams--consisting of tankdozers and DD-tanks. These teams were created along the lines of the British model, and rehearsed at the Invasion Training Center established in the vicinity of Naples. See Beck et. al., *The United States Army in World War II: The Technical Services. The Corps of Engineers: The War Against Germany*, pp. 436-443.

³⁷Field Marshal Sir Bernard L. Montgomery lecture, 448.

CHAPTER 5

CONCLUSION

The smaller our Army in peace-time the greater the need for a strong and robust organization devoted to research and experiment; in the British Army the nucleus of this organization may well be the 79th Armoured Division.¹

Field Marshal Sir Bernard L. Montgomery, *The Story of the 79th*

The end of hostilities in Germany marked the end of the 79th Armoured Division. The division would disband, with its subunits to be parceled out to other British Army formations in various theaters. The division had acquitted itself well in its brief existence, accomplishing a great deal in terms of equipment, organizational and tactical developments. Units from the division participated in every 21 Army Group operation from Normandy onward, usually in the van of each assault, and had done so with the relatively modest losses of 379 tanks (approximately twenty-five percent of the frontline total) and just under 1500 soldiers killed, wounded or missing (approximately seven percent of the divisional strength at its high point).² Perhaps the greatest contribution of the division (other than the myriad of armored vehicles in the inventory) would be in the detailed after action reports that would serve as the basis for future doctrinal and technical developments.

Postwar Development

Hobart would continue to impress upon the War Office as to the requirement for further development of specialized armor. In the division's final report Hobart wrote that:

Weapons new in this war may soon be rendered obsolete by later inventions. A twofold problem is thus presented: to continue the development of existing weapons so that at any time we can go to war with the most up-to-date equipment available; and at the same time to explore entirely new possibilities which may

give us better and newer weapons. Until the “new” is sufficiently developed we cannot afford to abandon the “old” tried weapons and methods.³

His thoroughly expressed views on research and development would result in the creation of an organization known as the Specialized Armour Development Establishment (SADE), later named the Specialized Armour Establishment (SAE). Hobart would command the unit (until his final retirement in March 1946), taking with him Brigadier Duncan--as well as Colonels A. W. Brown and A. Jolly, former 79th Division operations officers. During this organization’s six years of existence (1945-51) it would both improve upon legacy capabilities and develop wholly new equipment. Improvements were made to DD-tanks, Crabs and ARKs, while AVREs were totally reworked with an upgraded chassis and improved capabilities. One example of a new vehicular development was the Sea Serpent, an amphibious flamethrower.⁴

The British would face a decision after the war on what direction they would take in armored development, specifically that of the role and function of the tank. There were some who felt that it would be best to design one chassis that could then be outfitted with any number of variations to suit different operational requirements, some similar to those of the specialized armor of the 79th Division. The mainstream opinion of the armor community recognized the need for specialized armor, but felt it should not impinge upon the requirement to develop a suitable main battle tank. Hobart echoed this opinion, believing that special purpose vehicles had to be kept to an absolute minimum, and that any special requirements must be able to be adapted to the standard tank at that time.⁵

After the SADE/SAE disbanded in 1951, bridges, flails and AVREs would continue to be developed, through an organization known as the Fighting Vehicle Research and Development Establishment. Development centered on a suitable armor

platform (the Chieftain), over which there was great debate. In the end, bridges would be fitted to the main battle tank, and their specialist role and function would place them in the armored engineer force structure, to serve alongside AVREs, which would also be refined for continued service. The Crab flails, Crocodiles and CDLs would not be integrated into the next generation of British armored vehicles. They had served their purpose (albeit limited in the case of CDLs), and their niche capability could not be justified in a smaller force.⁶

Unit Legacy

In the three short years the 79th Division performed its specialized mission a great number of accomplishments were realized. The operational and tactical successes that the division directly influenced were numerous, with the OVERLORD invasion being foremost, but only one of many. The long-term impacts of the division are even more important, and continue to be relevant. Tactics, techniques and procedures first developed by the unit have survived through various permutations, and the 79th's influence can still be seen in the following operations: amphibious assault, use of armor in an urban environment, strongpoint assault, obstacle breaching and deliberate river crossing operations.

The unique mission and role of the unit also allowed it to accelerate combat developments and requirements determination, primarily through the ability of the commander to directly coordinate with industry and the Ministry of Defense. This was a watershed event, marking the first time a divisional unit had been provided the scope and flexibility to modify and tailor equipment, tactics and organizational structure in order to establish best practice for mission accomplishment. The U.S. Army has tried this

approach to varying degree and success since then, most notably in testing the airmobile concept with the 1st Cavalry Division in 1964, the motorized and High Mobility Test-Bed concept using the 9th Infantry Division in the 1980s, and the dual on-going efforts with digitization (first centered on the 4th Infantry Division) and the Stryker Brigade Combat Team (SBCT) concept at Fort Lewis, Washington. There are parallels to the 79th in each of these organizations, and valuable lessons can be drawn from each to further future endeavors.

Another area in which the 79th became very expert at was in the continued refinement and never ending training of its soldiers and leaders. The division was quite adept at identifying training gaps and weaknesses and internally addressing methods by which these shortfalls could be overcome. It is informative in the way by which the division was able to quickly respond to tactical and organizational challenges, primarily in the internal formation of expert-producing training wings. These wings took lessons learned and observations--collected from the division's staff and leadership--and developed new tactics, techniques and procedures to surmount these newfound challenges. That the unit was able to accomplish this in England prior to OVERLORD is to be applauded, but that these efforts continued to be successfully applied in the midst of an offensive campaign are truly remarkable. This continued emphasis on training and adaptation allowed the division to expand its influence and relevance, and provided added credence to the expert advice provided by the division's LOs and subunit leaders.

Application For Today

The legacy and lessons of the 79th Division are relevant and provide credence to the transformation efforts currently underway in the U.S. military. That should be

apparent from the points just mentioned, but the application of the unit's legacy to current efforts contains a deeper, and less pronounced thread. There has been a great deal of debate over the past decade as to an ongoing "revolution in military affairs" (RMA). It is within this RMA debate that interesting parallels can be drawn to the experience and lessons of the 79th Division. Perhaps the best way to describe these parallels are through the fundamental elements of an RMA--technological change, systems development, operational innovation, and organizational adaptation--as they are descriptive of the core challenges that the division faced during its lifespan.⁷

The current RMA debate has centered primarily on the informational and related technological aspects, leading some pundits to question whether in fact the U.S. military is experiencing an RMA, or a military-technical revolution (MTR). There is a danger in focusing too much on the technology, as the history of military revolutions and RMAs shows that technology is only one part (though usually a critical one) of any revolutionary movement. As the case of the 79th Division demonstrates, innovations in technology can only take an organization so far. These technology and equipment developments, even if accomplished in a rapid, well-synchronized fashion, can only be fully realized with requisite changes in each of the other RMA fundamentals.

The military has a marked tendency to make new equipment fit into extant organizations and doctrinal constructs, particularly during interwar periods when a military may lack focus (unknown threat) or resources (reduced manpower and budget). This approach stymies any ability to fully realize the potential of this new capability. It is in this regard that the 79th was especially successful in breaking out from old ways of doing business. Granted, the unit had the dual advantage of being well resourced and

having a full understanding of the threat (and perhaps this is why military innovation is most successful during times of war). However, the 79th adapted its organizations and doctrine (in the form of tactics and drills) to account for newly developed capabilities. The U.S. Army appears to have realized the importance of doing this as demonstrated by the current transformation efforts centered on the SBCT.

Adapting doctrine and organizational structure to leverage advances in technology implies that new approaches to training must occur. The novel approaches taken by the 79th provide a useful template by which current military trainers can proceed. Unit-led training conducted by subject matter experts (SMEs) is an approach most organizations are quite familiar with. The requirement should now be to take that method to the next level, and incorporate distributed and distance education methods, tied into a repository of accepted best practice culled from units in the field. In essence, this method means SMEs would indirectly teach, coach and mentor soldiers who they would never have direct contact with, an on-line, electronic version of the 79th training wing concept.

However, improvements in doctrine, training and technology can only take an organization so far along an evolutionary path. To truly change the way in which any military conducts its core business, creative leaders with innovative skills are required. This implies an attitudinal change that both inculcates and rewards independent thinking. As Eliot Cohen has noted, "In a period of revolutionary change in the conduct of war, different kinds of people--not simply the same people differently trained--rise to the top of armed services."⁸ This point was aptly illustrated by Hobart and his cadre of like-minded subordinates, and fostered by leaders such as Montgomery, Alan Brooke and Churchill, who fully underwrote their innovative efforts.

Changing the way in which leaders think and behave requires a wholesale culture change, though one that is more perhaps more evolutionary than revolutionary. As the U.S. Army has learned (especially through the example of the German army in World War II and their use of mission-type orders--*Auftragstaktik*), successful military commanders must be able to clearly articulate their intent to subordinates so that the mission at hand can be accomplished, if required, through the initiative of junior leaders in lieu of further guidance from above. This expression of intent is more art than science, and to a large extent relies upon the experience and intuition of the commander. It is in essence the leader's "vision," that which must occur for the organization to be successful. Yet, as has been aptly noted, "vision without action is merely a dream, action without vision merely passes the time, [and] vision with action can change the world."⁹

Hobart had a unique combination of vision and practical experience that distinguished him from most of his contemporaries. He was able to adapt whatever he needed from ideas presented by others, mixing it with his own ideas and opinions--ever consistent with his vision--and then provide the necessary leadership that would turn ideas into reality, overcoming a legacy of outdated tactics and obsolete equipment. In the guise of the 79th Division, Hobart had helped successfully develop and exploit a new capability, an all-mechanized, highly armored assault force.

This may be the most important point for the U.S. Army to focus on as it faces the current challenges imposed by living through times of rapid change. Improvements in equipment, doctrine modifications, and tailored organizations will only take an army so far along the revolutionary continuum. Although technology continues to develop at a rapid pace, the U.S. Army must recognize that it is still in its infancy in terms of

demonstrating any marked change in doctrine, organizational structure and these all-important leadership behaviors (culture). Leaders able to articulate a viable vision for the future are still in the minority, and though service parochialism, shortsightedness and inflexibility seem to be waning, there are still resident traces that run deep in the psyche of many current leaders.

It is important to remember that changing leader behavior and culture takes time, and almost always runs behind revolutionary (evolutionary) changes in other areas. It took twenty years for Hobart to finally realize some of his vision, yet history provides numerous other examples of visionaries who never live to see their efforts realized. Taken in this regard, it is easier to accept the belief that an RMA is not a cataclysmic event, but a ripple over time. The 79th provides a useful case study, not because they heralded an RMA (it can be successfully argued that they marked the end--or realization--of an RMA begun at the end of the First World War), but because this unit, and its commander, successfully fused change in all four core components (technology, doctrine/training, organization, leadership/culture). It is only through this successful fusion that any change, characterized as revolutionary in nature, can be realized.

¹*The Story of the 79th Armoured Division*, foreword (no page number).

²*Ibid.*, 291-2; *79th Armoured Division Final Report*.

³*79th Armoured Division Final Report*, 1.

⁴Fletcher, *Vanguard to Victory*, 68-72.

⁵R. M. P. Carver, "This Universal Tank Controversy," *British Army Journal* no. 4 (July 1950), 10-11; P. C. S. Hobart, *Memorandum on Specialized Forms of Armour* (February 1945), para. 28, Liddell Hart Archive file 9/28/90.

⁶Richard M. Ogorkiewicz, "Developments in Armor: New British Tanks and Armored Vehicles," *Armor* (January-February 1962), 24-27. This organization oversaw the substantial upgrade of tank-launched bridges and a complete reworking of the AVRE, to include the addition of a large dozer blade. A new piece of equipment, a Beach Armoured Recovery Vehicle (BARV), was developed for use on future amphibious operations.

⁷Andrew F. Krepinevich, "Cavalry to Computer: The Pattern of Military Revolutions," *The National Interest* 37 (fall 1994), 30.

⁸Eliot A. Cohen, "A Revolution in Warfare," *Foreign Affairs* 75, no. 2 (March-April 1996), 48.

⁹Joel Baker, from *Applied Strategic Planning: How to Develop a Plan That Really Works*, ed. Leonard Goodstein, Timothy Nolan and J. William Pfeiffer (New York: McGraw-Hill, Inc., 1993), 39.

APPENDIX A

PHOTOGRAPHS



Fig. 1. Major-General Sir P.C.S. Hobart. Reprinted with permission of The Tank Museum, Bovington, Dorset, England.



Fig. 2. ARKs in convoy. Reprinted with permission of The Tank Museum, Bovington, Dorset, England.



Fig. 3. AVRE deploying SBG bridge. Reprinted with permission of The Tank Museum, Bovington, Dorset, England.



Fig. 4. Churchill with “Bobbin” device. Reprinted with permission of The Tank Museum, Bovington, Dorset, England.



Fig. 5. AVRE towing Conger explosive rocket. Reprinted with permission of The Tank Museum, Bovington, Dorset, England.



Fig. 6. Sherman Crab in operation, with observer dangerously close to the action. Reprinted with permission of The Tank Museum, Bovington, Dorset, England.



Fig. 7. Crabs loading LCT while on exercise. Reprinted with permission of The Tank Museum, Bovington, Dorset, England.



Fig. 8. DD-tanks conducting training in Scotland. Reprinted with permission of The Tank Museum, Bovington, Dorset, England.

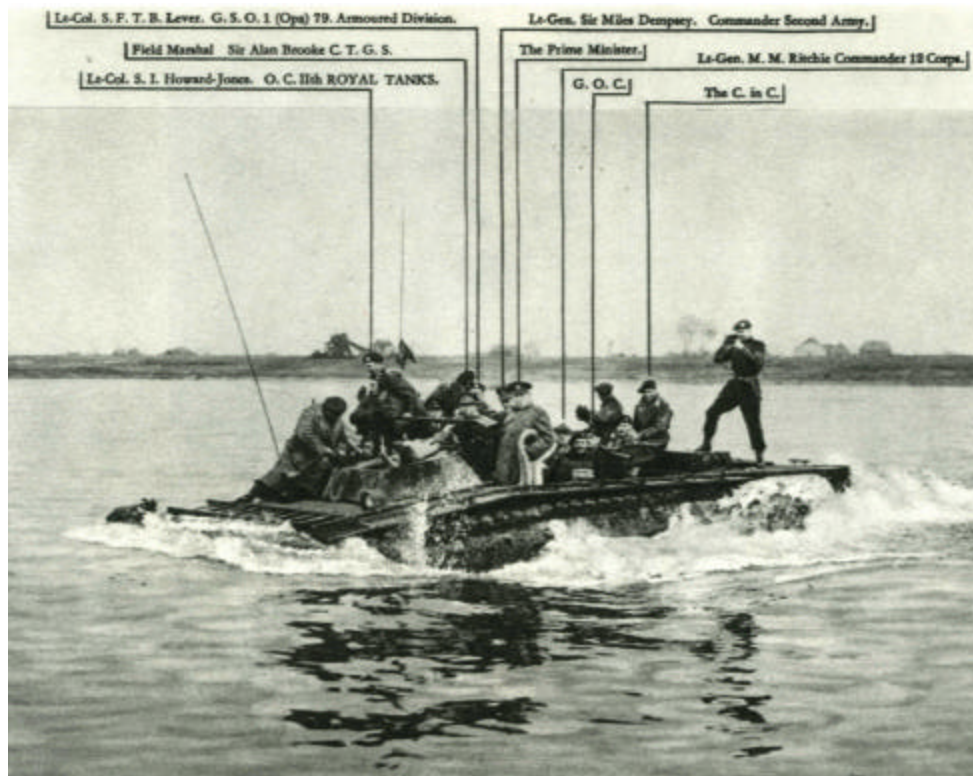


Fig. 9. Buffalo crossing the Rhine during PLUNDER, laden with British civilian and military leaders. Reprinted with permission of David Fletcher and The Tank Museum.

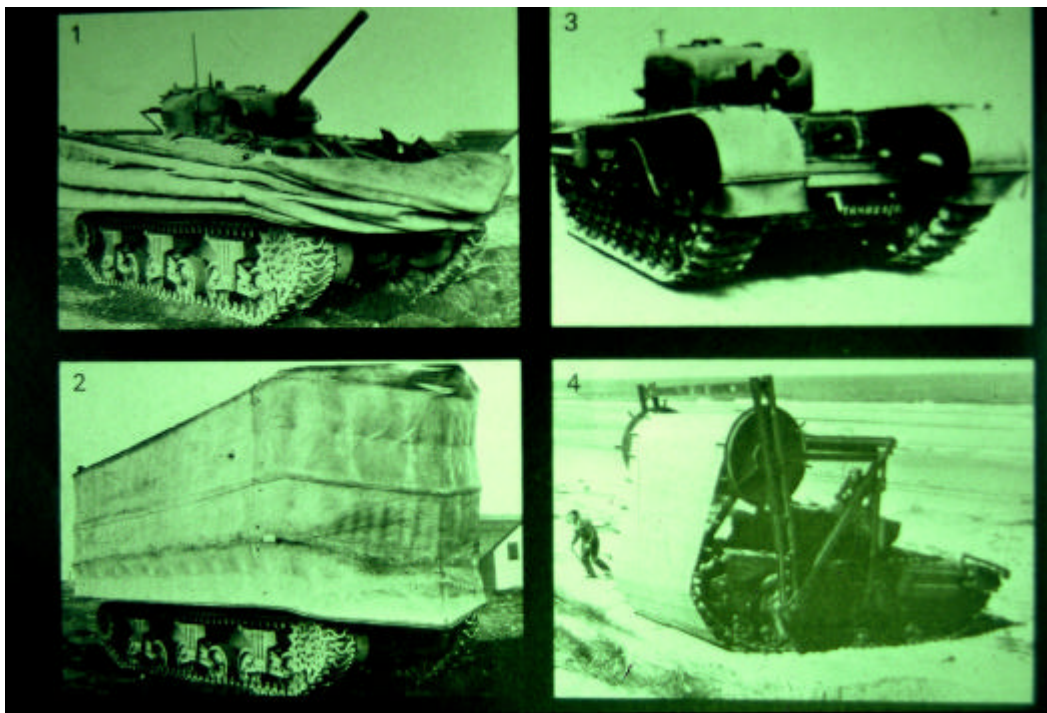


Fig. 10. #1 - DD-tank with shroud lowered, #2 - Churchill AVRE, #3 - DD-tank with shroud raised, #4 - Churchill AVRE Bobbin. Reprinted courtesy of CARL.



Fig. 11. German obstacle belt covering Normandy beach exit. Reprinted courtesy of CARL.

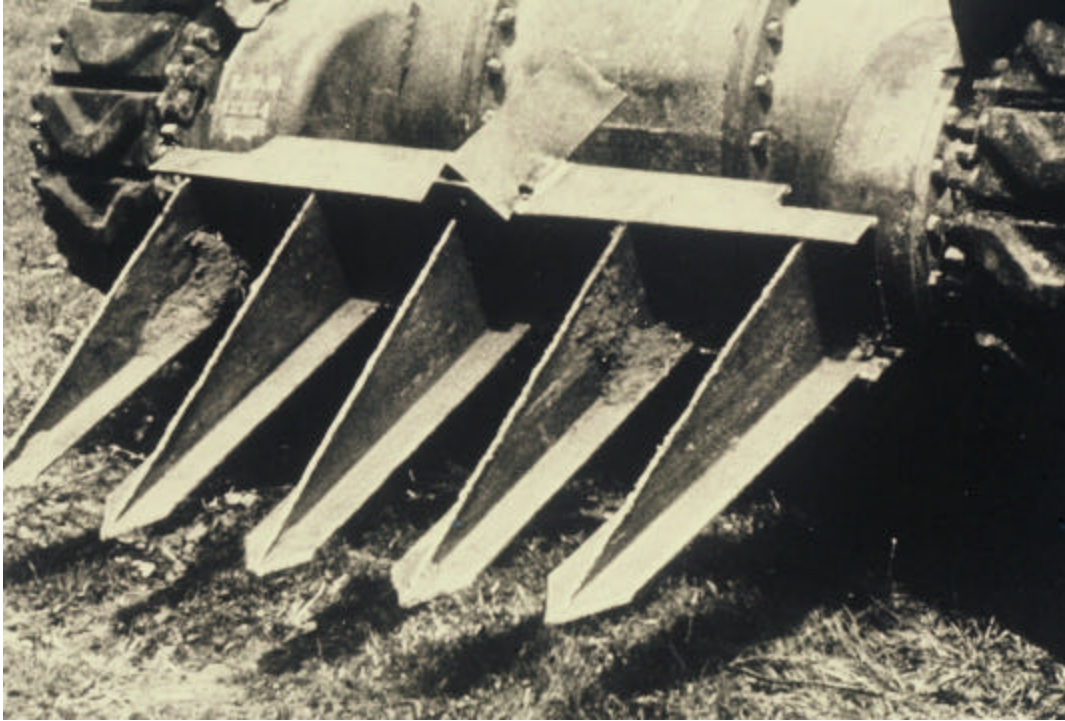


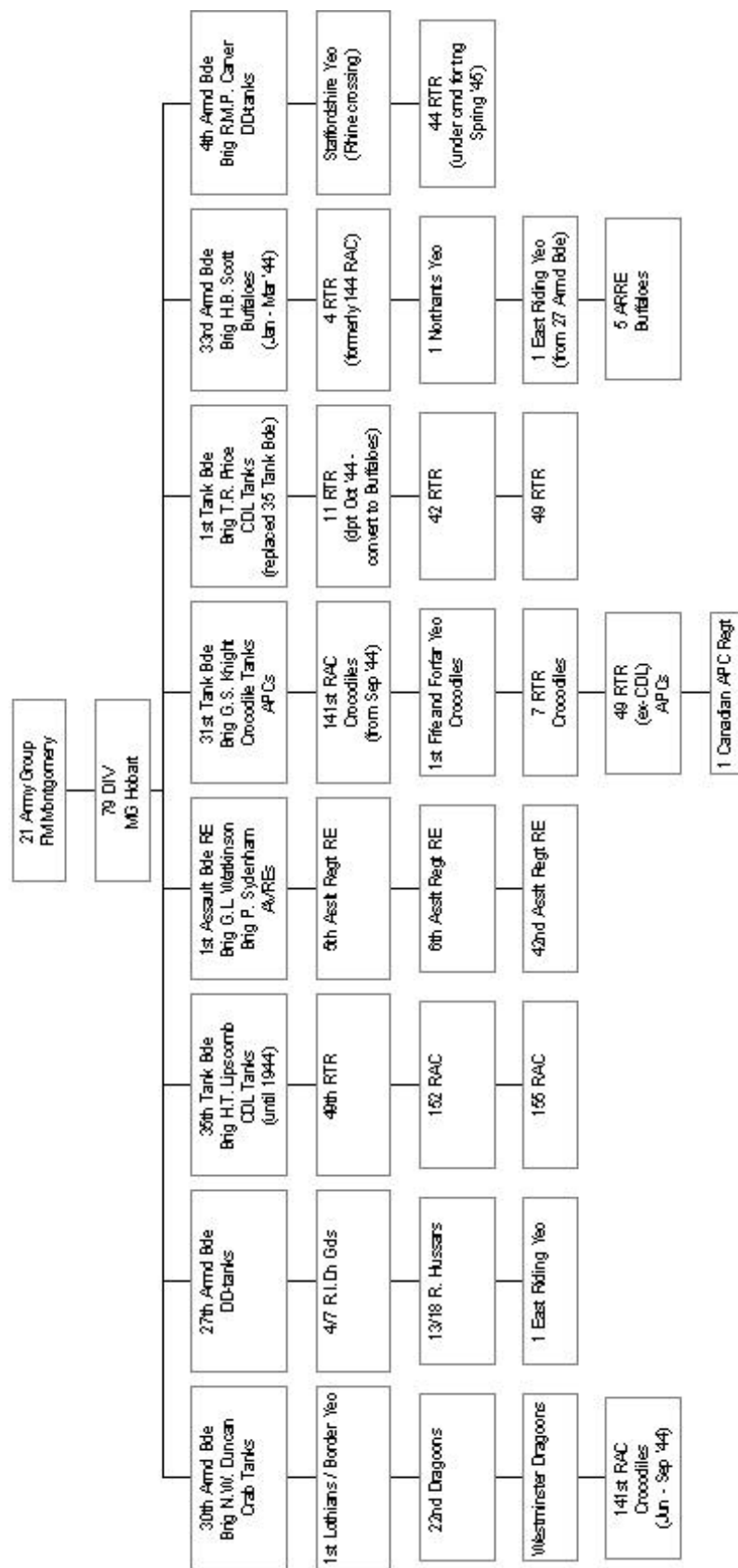
Fig. 12. U.S. Army hedgerow cutter device used in the bocage country. Reprinted courtesy of CARL.



Fig. 13. Sherman tankdozer. Reprinted courtesy of CARL.

APPENDIX B

79TH DIVISION ORGANIZATIONAL CHART



Adapted from information contained in Nigel W. Duncan, *79th Armoured Division: Hobo's Funnies* (Windsor, England: Profile Publications, 1972, 16; *The Story of the 79th Armoured Division*, 294-296.

APPENDIX C

OPERATIONAL MAPS

21 Army Group Invasion Beaches 6 June 1944

To show assaulting divisions and 79th Armoured Division units

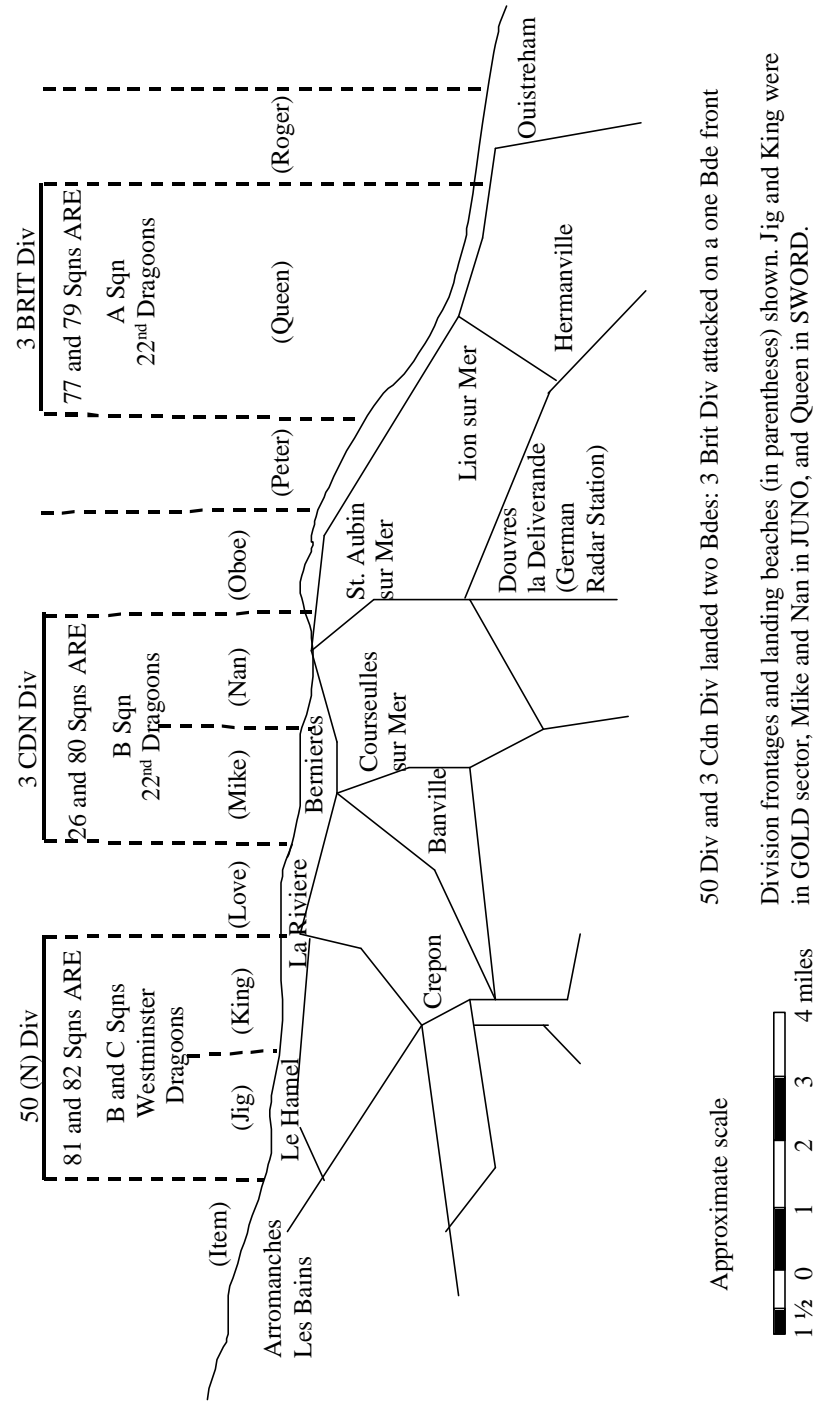


Fig. 14. Map of OVERLORD Invasion Area, 21 Army Group.

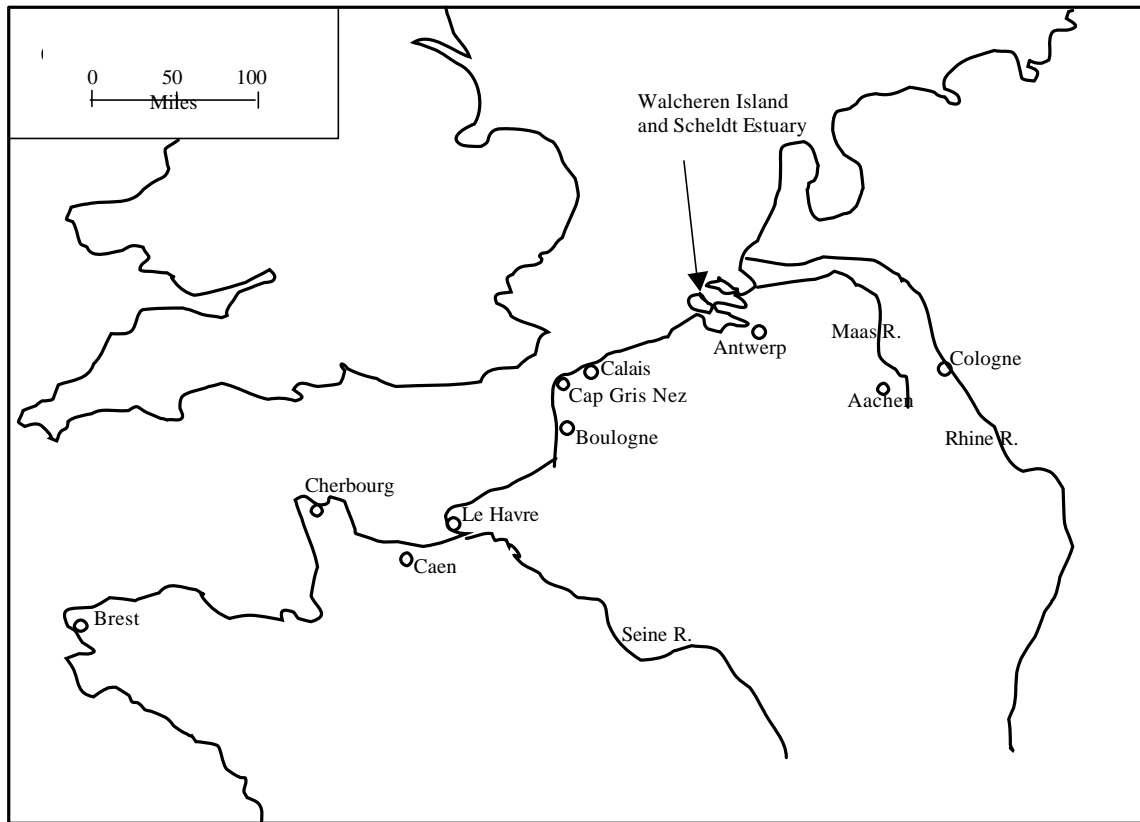
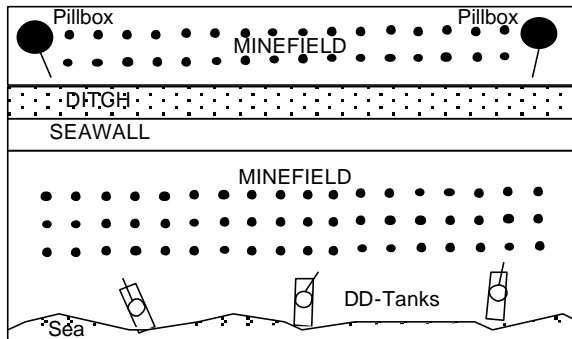


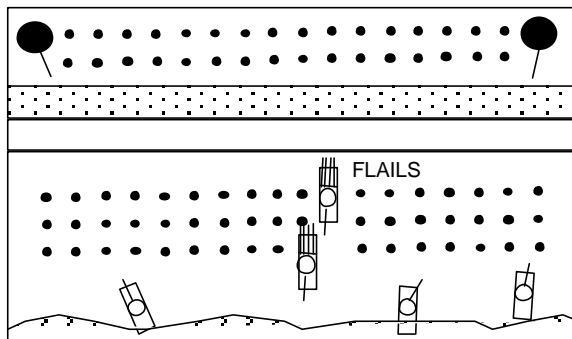
Fig. 15. Map of Northwest Europe Operational Area.

APPENDIX D

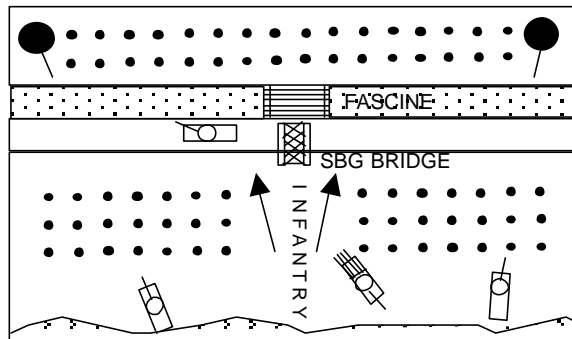
ASSAULT TEAM DIAGRAMS



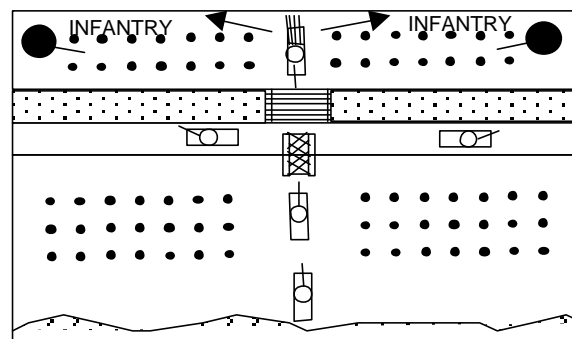
The first vehicles ashore were the Sherman DD-tanks. Upon landing they lowered the float shrouds and began firing at German positions.



Crab flail tanks followed (landed from LCTs), and began flailing through the beach obstacles. They worked in pairs as they cleared the minefields.



Once a lane was cleared an AVRE would move forward to emplace a SBG Bridge onto the seawall (or over a bomb crater). A second AVRE scaled the wall, emplacing a fascine on the far side. Infantry and DD-tanks provided support.



The specialized armor continued to clear and reduce beach obstacles, while Crab and AVRE teams begin to clear routes inland. All types of tanks are also providing direct fire support for the assaulting infantry, concentrating on pillboxes.

Fig. 16. Beach Assault Team Clearance Drill. Adapted from R.A. Stewart, "Armour Versus Obstacles on the D-Day Beaches," *British Army Review* no. 66 (December 1980), 67.

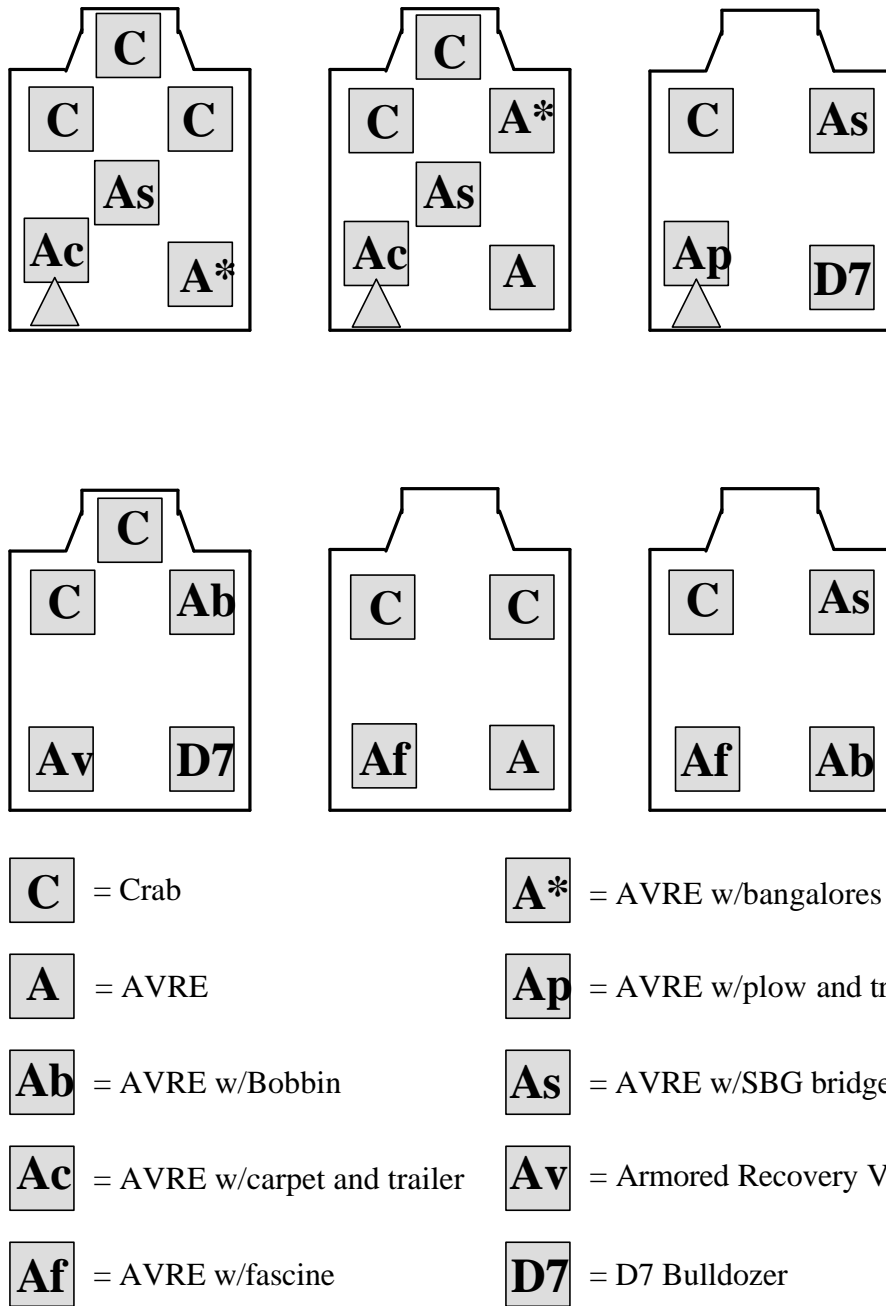


Fig. 17. OVERLORD LCT Loading Plans (Six variations used on the assault). Adapted from information contained in the *79th Armoured Division Final Report*, 74-76.

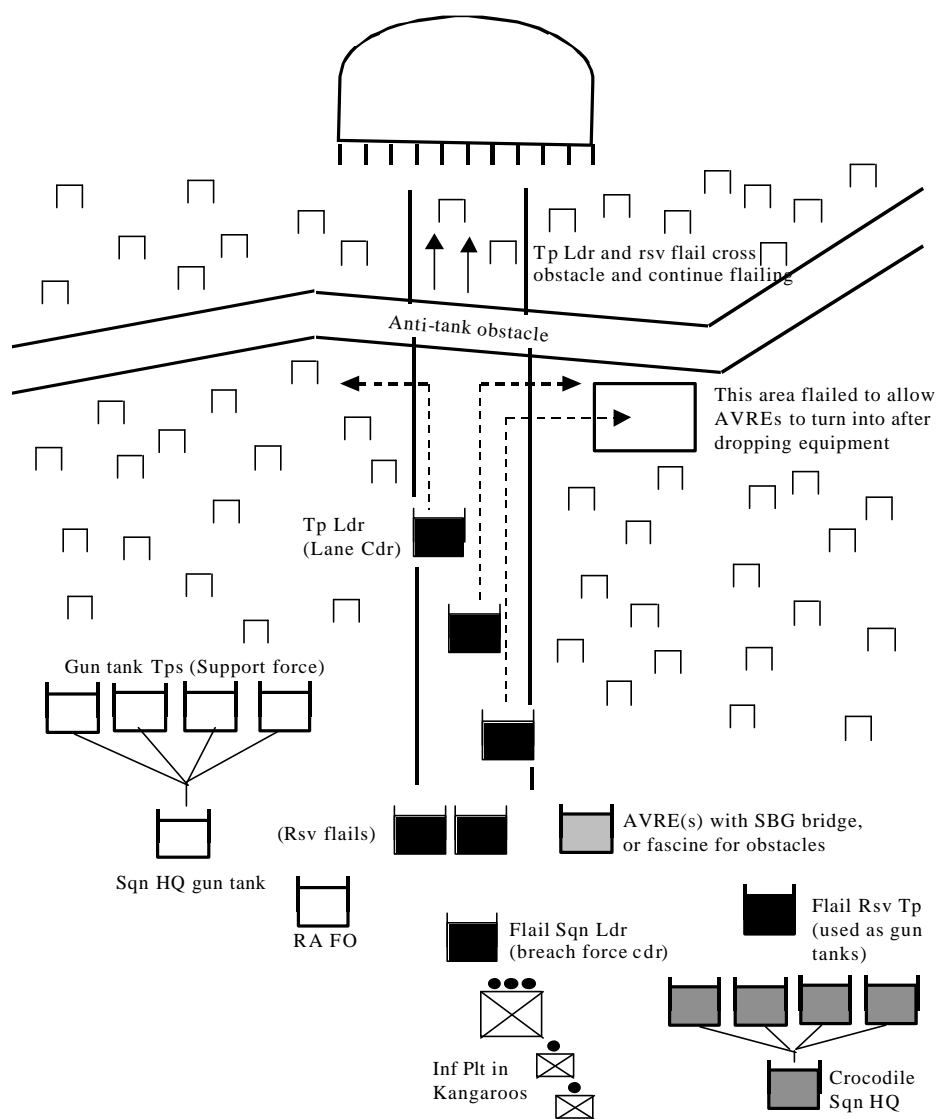


Fig. 18. Assault Team Tactics (Inland). Adapted from Nigel W. Duncan, *79th Armoured Division: Hobo's Funnies* (Windsor, England: Profile Publications, 1972), 17.

GLOSSARY

ANVIL. Codename for the planned 1944 Allied invasion of Southern France in the Toulon-Marseille area.

Bangalore Torpedo. Explosive device resultant from the Indian theater during World War I. They have developed over time but generally consist of a demolition-filled tube (around four feet long) that can be connected and “slid” through an obstacle.

Belgian Gate. Barricade-like gates used as underwater obstacles.

Bobbin. A device fitted on the front of an AVRE Churchill tank that spooled out a carpet of reinforced cloth. Primary purpose was to aid tank trafficability on beaches.

Buffalo. British nickname for an American amphibious landing vehicle tank.

Centipede. Mineroller designed at F Wing in Belgium, December 1944.

Conger. A rocket-propelled mine clearing charge, precursor to MICLIC and Giant Viper.

Crab. A minesweeping tank flail, mounted on a Sherman chassis.

Crocodile. British Churchill tank outfitted with flamethrower apparatus.

D Day. The first day of any military operation, specifically the day OVERLORD was launched.

DRAGOON. Codename for the Allied invasion of the southern coast of France, 15 August 1944, planned under the codename ANVIL.

FABIUS. Codename for the amphibious landing exercise conducted by all Normandy-bound assault forces (except Force U), conducted in early May 1944.

Fascine. A bundle of large sticks (or similar material) mounted to the top of a Churchill AVRE and used to drop into gaps and craters, allowing vehicles to pass over unimpeded.

Funnies. Generic term given to the British specialized armor employed by the 79th.

GOLD. Codename for the beach assaulted by troops of the 50th Highland Division (British), 6 June 1944.

GRENADE. Codename for 21 Army Group operation in the Rhineland, February-March 1945.

Hedgehog. Portable obstacle, made of three crossed angle irons.

JUNO. Codename for the beach assaulted by troops of the 3rd Canadian Division, 6 June 1944.

Kangaroo. Any variation of a turretless tank used for carrying infantry.

OMAHA. Codename for the beach assaulted by troops of U.S. V Corps, 6 June 1944.

OVERLORD. Codename for the invasion plan for northwest Europe, Spring 1944.

Petard. An explosive shape charge fired from an AVRE-mounted spigot mortar (230mm) used to reduce obstacles and/or pillboxes.

PLUNDER. Codename for 21 Army Group Rhine River crossing operations, March-April 1945.

Snake. A pipe, up to 400 feet in length, filled with high explosive and used to gap minefields (concept similar to a Bangalore torpedo).

SWORD. Codename for the beach assaulted by troops of the 3rd British Division, 6 June 1944.

TIGER. Codename for the pre-Normandy invasion exercise conducted by Force U (U.S. VII Corps), May 1944.

UTAH. Codename for the beach assaulted by troops of U.S. VII Corps, 6 June 1944.

VERITABLE. Codename for 21 Army Group operation for clearance of Reichswald, February-March 1945.

Weasel. Small tracked amphibious vehicle first used extensively by U.S. Marines.

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